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An outline of indications
and methods for the use
of modern light therapy

WITH FOREWORD BY
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Foreword

To the increasing number of practitioners, using ultra violet and allied therapeutic radiations, a handbook on Actinotherapeutic Technique which is informative but not diffuse, is an essential requisite.

Many admirable text books have appeared and, in addition, a mass of literature, in the form of original papers, so extensive and so scattered that it is beyond the powers of the majority of us to collect and assimilate. This handbook endeavours, and I believe very successfully, to supply a real need.

With the aid of this book the practitioner, with the requisite apparatus, has at hand, in convenient form, an aid to special technique in treatment which is practical, illuminating and helpful.

How many of us in practising light treatment have been presented with unusual or unfamiliar conditions for which we would have been grateful for the experience of others in their management ?

If such help is, at times, desired by specialists in this branch of therapy, it will be even more appreciated by those whose acquaintance with these aids to cure are more limited. The numerous references given to authoritative literature should prove of immense assistance.

I congratulate the compilers of this handbook on their diligence and on the care they have taken in its compilation. They have done their work with commendable thoroughness. I feel honoured in having been invited by the publishers to write this Foreword, and on behalf of my medical colleagues, I thank them for having placed this valuable volume at our service. I believe that it will be regarded as indispensable to all engaged in the practice of actinotherapy.

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Introduction

This book is intended as a working tool for those qualified to practise actinotherapy. In no sense can it replace the existing works of reference, but it does attempt to give a reliable epitome of their contents.

The arrangement of the book falls into two parts. The introductory section provides a brief outline of actinotherapy, in different aspects. Part II is an alphabetical list of conditions in which light therapy has been applied, with outlines of the technique which has been used, and references to literature.

Nearly 1000 books and papers have been correlated to build the outlines of a technique which is substantiated by reliable authorities for each indication mentioned.

The titles of these books, and references to papers, are given to assist the reader in obtaining fuller information. There has been no attempt to form any complete bibliography of actinotherapy. The inclusion of any work has been governed by three practical considerations :—

That its writer has personally treated the condition (or describes work not otherwise available).

That technique, case histories, etc., are stated.

That the publication has not been superseded by later work and is reasonably accessible to medical readers.

To avoid needless repetition, the *detailed* reference to any work is given once only in this book (with a few exceptions, made for obvious reasons). Ordinal numbers have been added so that additional references are readily found. The titles given under any condition therefore occur in two groups :—

(*a*) Books and papers which deal specifically with that condition, quoted in full bibliographical form.

(*b*) Works of wider scope which yet furnish specific information on that condition, quoted by numerical references only, and easily traced by the running reference entries which head each page.

So far as possible, the references include reproductions or abstracts in "The Quartz Lamp" (Newark or Slough editions) and other physiotherapeutic journals.

In a work planned for compact format and easy reference, it is obviously impossible to give more than guiding outlines of technique. These will need adaptation to the requirements of each case individually : the physician is treating patients and not diseases. For clearness and simplicity, the technique data are stated for certain standard types of actinic sources. It is emphasized that they should not be applied unchanged to other types of apparatus.

In a work intended for use by qualified practitioners of medicine, it should be superfluous to point out that most ailments call for due use of the triad which includes physical therapy (of which actinotherapy is one branch) with medicine and surgery. The scope of this book precludes detailed notes on concomitant therapeutic measures ; reference is made to these only when they present some special phase of interaction with actinotherapy. At the same time, the use of actinic radiation does not in any sense restrict the practitioner's therapeutic resources ; rather does it enlarge them by supplementing and assisting the action of other measures.

The compilers or publishers will welcome any suggestions or corrections from the medical profession which may help to make the book more fit for its purpose, and so to assist, however humbly, in the advancement of medical science towards its ultimate goal of mastering disease.

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Part I

CHAPTER I.

Physical Data

General.

A systematic treatment of radiation physics would be beyond the scope of this book. It is assumed that the reader has a general understanding of such matters as the theory of electro-magnetic vibrations, the transformation of these vibrations into other forms of energy when they are absorbed, and the common units of measurements used in electrical work. A short list of recent books and papers is given which will assist further reading in these subjects in connection with light therapy.

Units and Constants.

The following data are stated for reference :—

Spectrum wave-lengths :

1 A.U. (Angstrom Unit) $= \frac{1 \text{ mm.}}{10{,}000{,}000}$ (10^{-7} millimetre).

1 $\mu\mu$ (millimicron) $= \frac{1\ \mu}{1{,}000}$ (10^{-6} millimetre).

1 μ (micron) $= \frac{1 \text{ mm.}}{1{,}000}$ (10^{-3} millimetre).

The unit commonly used in Britain is the A.U.

Speed of Transmission : (Velocity of light, uniform for all electro-magnetic vibrations)=300,000 kilometres per second.

Electrical units :—

Volt =Unit of electro-motive force (i.e., that pressure which will cause a current of 1 ampere to flow against a resistance of 1 ohm.

Ampere=Unit of rate of transfer of electricity.

Watt =Unit of quantity of electricity transferred, i.e., the amount of current consumed when a current of 1 ampere flows at a pressure of 1 volt.

Ohm =Unit of resistance to electric flow, i.e., the resistance of a column of mercury 106.245 cm. long × 1 mm. diameter at 0° C.

Radiations used in Actinotherapy.

The groups of electro-magnetic vibrations used in actinotherapy are :—

	Wave-lengths (A.U.)	Frequency.	Notes.
Ultra-violet rays :—			
Short region	1850	16×10^{14} /sec.	Limit of transmission for quartz.
Middle region	2200	13.5×10^{14} /sec.	The erythema producing rays.
Near region	3130	9.5×10^{14} /sec.	Pigmenting rays.
Visible rays	3900	7.5×10^{14} /sec.	
Infra-red (near region)	7600	4×10^{14} /sec.	Rays of deep penetration.
(long rays)	15000	2×10^{14} /sec.	Little penetrating effect.
	40000	7.5×10^{13} /sec.	

Special Physical Aspects.

A certain aspect of radiation physics which has special significance for the practitioner of actinotherapy is considered in outline here, i.e. the output of different sources in the various spectrum regions. The spectrum photograph of any source gives merely a qualitative indication of its emitted energy. It is necessary to know also how the total energy radiated is divided between the different parts of the spectrum. To determine this accurately requires the resources of a specially equipped physical laboratory. For practical use in actinotherapy the problem narrows down to estimating dosage in terms of biological reactions to certain short wave-lengths. This makes it practicable to estimate the output of a source either by physical methods (spectroscopy, photolytic measurement) or by biological estimation (erythema reaction, bactericidal effects, etc.). A classified list of recent publications on the subject will be found on page 15 (8-33).

Book Nos. 1–49

The energy distribution of the quartz mercury arc and other standard sources used in therapy are well established, and the user can rely on approximately constant energy distribution, provided that lamps are operated to instructions. Most users find it sufficient to standardize their lamps by occasional erythema lists on a standard subject, or by a simple gauge such as the actinometers specifically designed for use with quartz lamps.

Output Characteristics of Standard Lamps.

For effective use in actinotherapy, a source must generate adequate total radiation. Further, a sufficient proportion of this total must be generated in the required section of the spectrum. For the standard sources discussed in this book, the output characteristics are :—

	Ultra-violet.	Visible.	Infra-red.
Sollux Lamp (9)	0.2%	7.6%	92.2%
Quartz Mercury Arc, air-cooled (41 43a). ...	28%	20%	52%

With the Kromayer Lamps, as water-cooling reduces the proportion of infra-red output, the percentages of visible and ultra-violet radiation are considerably higher (34).

See output diagram, page 18.

The distribution characteristics of a quartz burner are practically constant throughout its operating life. An aged burner shows decrease in total output, which affects both the short and long ultra-violet and the visible spectrum in a nearly equal measure (Anderson). A list of recent technical papers on the mercury vapour arc will be found on page 16 (34-43a).

Filters and Screens.

The human eye is very sensitive to the short ultra-violet rays below 3150 A.U. It is essential to use goggles which completely protect the eyeball, or efficient screens, when using ultra-violet sources. Most commercial glasses, in adequate thickness, are opaque to the irritant rays, and therefore safe as screens.

Filters.

In certain therapeutic and other applications, the need arises for filters which will transmit certain portions of the spectrum. Following are transmission data for the filters mentioned in this book :—

Filter.	Uses.	Spectrum Limits (A.U.)	
		Short.	Long.
"Diagnosis" ...	Fluorescence (excluding visible light).	3000 — (maximum at 3660)	4000
"Uviol White" (2 mm.)	Exclusion of shortest ultra-violet rays.	2600 —	——
"Uviol Blue" (2 mm.)	Exclusion of shortest ultra-violet rays.	2750 — (6550 —	5000 30,000)
Sollux Red ... (2 mm.)	Red and infra-red radiation.	6000 —	——
Sollux Blue ... (2 mm.)	Blue and infra-red radiation.	3010 — (6550 —	4550 30,000)

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CHAPTER II.

Physiological Effects

The presentation of actinotherapy throughout this work is based on actinic irradiation developed by standard quartz lamps, introducing luminous heat (infra-red) as an adjuvant. The two sources are complementary in their output characteristics (see diagram, page 18) and to a considerable extent in their therapeutic application also. It may at first appear paradoxical that both lamps are sometimes prescribed in the same infection. This applies particularly to those conditions which pass through an acute to a chronic stage. To the practitioner who treats patients and not diseases, each lamp has its logical place in treating such a condition. During the acute febrile stage (generally speaking), actinic rays are contra-indicated. The body's natural defensive mechanism is active; and where the acute infection is confined to a small area, a localized hyperaemia will be set up around the affected focus. The phagocytic activity of the blood, enhanced by the local hyperaemia, may be sufficient to overcome the invasion. The best known means to assist and supplement this natural reaction is local irradiation with luminous heat rays. Although these rays produce no notable changes in the blood chemistry, they effectively produce and maintain powerful, penetrating hyperaemia.

At a later stage the clinical picture is changed. Unless the infection is overcome, invading bacteria have established a focus. Their toxins may be escaping into the blood, which is no longer able to overcome the invasion. At this stage, luminous heat is ineffective. The immunizing forces of the

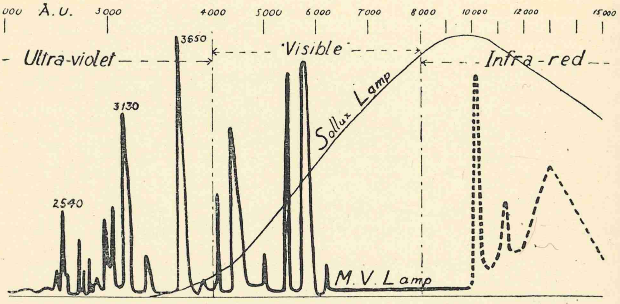

FIG. 1. **Energy distribution of standard sources.**
(*Correlate this with Fig. 2, below*).

Heavy line : The mercury vapour arc in quartz. (The Alpine Sun Lamp radiation extends into the infra-red region up to 15,000 A.U. and beyond).
The Kromayer Lamp radiation is weakened from 8,000 A.U. upwards through absorption by water, and ends about 14,000 A.U.; shown dotted above.

Light line : The Sollux Lamp.

(Data supplied by Dr. W. T. Anderson).

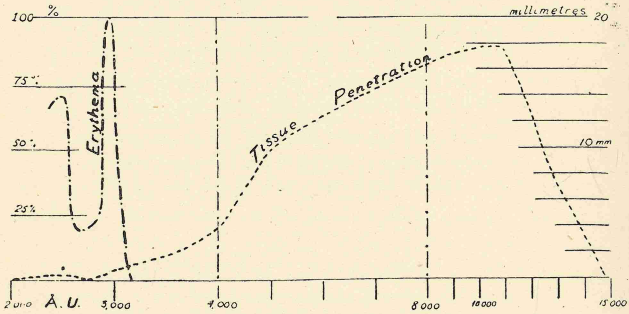

FIG. 2. **Skin and tissue reactions.**
(*Same scale as Fig.* 1).

(*a*) Skin erythema reaction, expressed in arbitrary units (Hausser & Vahle).

(*b*) Tissue penetration of different wave lengths expressed in mm. (Anderson).

organism must be stimulated to greater activity. This stage indicates irradiation with the ultra-violet rays.

There is a difference not merely of degree but in kind between the effects of infra-red and ultra-violet rays. The delayed actinic reaction is a call on the regenerative forces of the organism ; an alteration in its bio-chemical processes. To produce it, the source applied must give an adequate output of the erythemogenic rays shorter than 3200 A.U. (cf. Fig. 2). The characteristics of the mercury vapour arc (cf. Fig. 1) account for its therapeutic value in this regard. Radiation develops its effects where absorbed, and the complete absorption of ultra-violet rays in less than 1 mm. of skin (cf. Fig. 2) demonstrates the power of the photo-chemical reactions which it evokes.

The aim in applying infra-red rays is to produce hyperæmia to the greatest possible depth in the irradiated area. All infra-red sources are "black body" radiators ; the wave-length of their maximum output is a function of their operating temperature. An infra-red source may give its maximum output from 80,000 A.U. (hot water bottle) down to 7000 (arc lamp) : the hotter its temperature, the shorter this wave-length, but since the tissues are penetrated most deeply by rays of 10,000 A.U., the most effective source for infra-red radiation is one with peak output of this wave-length ; i.e., operated at a temperature of about 2800° abs. (cf. Fig. 1).

The physiological effects of actinic ultra-violet rays are considered below. Knowledge of these effects must still be regarded as empirical, although advances in this field during recent years have been among the most marked in any of the provinces of medical science. The bactericidal action of actinic rays was observed in 1877 (139). The cure of rickets by actinotherapy was clinically established in 1919 (586 592) ; intensive research carried out in many countries gave a partial explanation of its action by 1927 when Vitamin D was identified. There is no satisfactory explanation yet of the vitamin's mode of action within the body, nor of the manner in which it derives from the skin into the circulation.

Other clinical results of ultra-violet irradiation are likewise established by observation, but largely unexplained. These include the changes it induces in the composition and circulation of the blood, its action on metabolism, and local or general nerve reactions.

When electro-magnetic rays are absorbed in any medium, energy is transformed. The resultant action may be physical, chemical, or physiological.

Baly (133) explains the action of ultra-violet rays in terms of physical chemistry. The reactions of a living organism are high-energy chemical processes. A reacting system of high-energy levels tends to lose its energy unless some mechanism is at hand to maintain it. If the energy content fall below a critical minimum value, the reactions will cease and the organism decay.

A photo-chemical reaction in the human body is a high-energy chemical process of this kind. It is dependent upon the supply of radiation having a critical minimum energy content. Since the size of the energy-quantum varies inversely with the wave-length of radiation, it follows that a high-energy reaction can be effected only by rays up to a limiting maximum wave length. The synthesis of Vitamin D in the organism, for example, is effected only by rays shorter than 3020 A.U. ; the erythema reaction by wave-lengths of 3200 and less. It is significant that high-energy chemical reactions always occur at a surface, and the human skin is compared to the leaf of a plant in its adaptation for absorbing radiation.

Penetration of the Skin.

Penetration is an important factor. When the skin is dehæmatized by compression, penetration may be increased ; otherwise, all rays shorter than 3000 A.U. are absorbed by 1 mm. thickness of skin. The longer ultra-violet rays (over 3000 A.U.) have somewhat greater penetration, but are all absorbed between the stratum corneum and the dermis.

Rost (132) states the absorption of ultra-violet rays in the various skin strata :—

S. corneum	—	some fluorescence.
S. lucidum	—	little action observed.
S. granulosum	—	
S. germinativum	—	absorption : reaction (pigment formation).
Papillæ	—	endothelial absorption : vascular enlargement : erythema.
Corium	—	direct absorption by capillaries (assumed but not demonstrated).

The visible rays increase in penetration as they increase in wave-length (64). Of the radiations used in actinotherapy, the visible red rays (to which the blood is transparent) and the short infra-red up to 11,000 A.U. have the greatest penetration (see diagram, page 18).

In the infra-red region, penetration diminishes with increasing wave-length. Rays longer than 15,000 A.U. are totally absorbed in 3 mm. of skin. The most effective sources to produce deep penetrating hyperaemia are therefore those with a large output of visible light and of the shortest infra-red rays. The subject has been well investigated in recent years—a list of important papers is given on page 27.

Effects on the Skin.

The local reaction of the skin to actinic rays is the latent erythema which develops after a few hours. The latent period varies inversely with the exposure (63 81) and may range from 1 to 8 hours. The erythema is not a primary but a secondary reaction, associated with increase of temperature and emission of heat by the skin.

The wave-lengths most active in producing erythema are those below 3200, with maxima about 2970 and 2500 A.U. (see the diagram on page 18).

The erythema reaches its maximum 8 to 24 hours after exposure, and then subsides. A mild erythema (first degree) may practically disappear within 24 hours. There are great individual variations in the onset, peak, and total duration of erythema reactions ; Schall and Alius have studied these in detail (68 69 76).

Histologically, the erythema is associated with enlargement of the capillary vessels, which are filled with erythrocytes, and with leucocytosis in the irradiated area. The inflammatory reaction is not confined to the irradiated surface, but extends deeply into the tissues.

In relatively few conditions (ulcers, wounds, dermatomycoses) is the direct bactericidal action of light exercised on the human body. Actinic irradiation takes effect primarily on the skin functions, which in time set up secondary reactions in the organism as a whole.

Memmesheimer (77) explains the process as follows :—The skin is conceived as a gland with internal secretions, which are of importance in the defensive mechanism of the body ("esophylaxis"). Under the stimulus of actinic rays the walls of the skin-cells in the absorbed layers become permeable, and substances pass from the activated cells outward into the blood. These substances (the so-called "detoxin") consist of tyrosin and other amino-acids. They promote increase of antibodies in the blood.

Other substances transmitted from the irradiated skin-cells into the blood resemble histamine in their action.

Very powerful local erythema (dermatitis bullosa) releases products of inflammation from the cells which have the same effect as parenteral proteins (831).

Pronounced erythema is followed by desquamation. A severe (fourth degree) erythema will produce blisters, due to exudation of leucocytes between the horny and granular layers of the epidermis ; these heal without scars.

Pigmentation is due to the production of oxydase ferment ("dopa") by the skin cells during the regenerative phase

which succeeds their first response to light stimulus. This ferment leads to the formation of melanin caps on the epithelial and basal cells of the epidermis. Pigmentation and erythema, although often associated, are not interdependent ; pigmentation is produced by longer-waved radiations than the erythema-causing band. The function of pigment is disputed ; Rost (132) and other authorities assert that repetition of the erythema reaction, avoiding pigmentation, produces best results. References [65–77] (page 28) show the most important recent publications on this aspect.

Fluorescence.

For a detailed summary of the use of fluorescent rays in the examination of blood, urine, bile, and of internal organs, the work of Radley & Grant (88) should be consulted.

In medicine, the chief application of fluorescence has been in the field of dermatological diagnosis. The detection of ringworm by its vivid green fluorescence is now routine procedure (see references under Tinea, Nos. [641] to [650]). Many other skin diseases also show characteristic fluorescences which are valuable aids in diagnosis.

Goodman (85) gives a useful list of characteristic fluorescences from which the following are extracted :—

Keratosis—white underlying fluorescence.

Leucoderma—white in vivid contrast to surrounding skin.

Pityriasis versicolor (microsporon furfur)—dull golden yellow glow.

X-ray dermatitis—marked fluorescence in patches, dark elsewhere.

Other authorities mention favus, impetigo, psoriasis (which gives a silvery appearance), as readily diagnosed by their fluorescence.

Anomalies such as eczematous changes and incipient X-ray dermatitis can be detected by fluorescence at a stage when they are invisible by ordinary illumination. Changes in teeth, hair, and other structures are more visible under the invisible rays than in daylight.

Effects on the Blood.

Experiments and clinical findings indicate that actinic radiation produces considerable changes, most probably indirect, on the blood and hæmatopoietic organs. Although there is some discordance in the recorded results, probably due to the different light sources utilized and to variations in the subjects, it is clearly established that blood-regeneration in anæmic conditions takes place more rapidly under irradiation than in its absence. The characteristic changes in the blood picture are probably developed by way of the sympathetic nervous system (595).

There is marked action on the white blood cells. The erythema-producing rays produce leucocytosis and lymphocytosis, with a shift in the differential leucocyte court (increase in polymorph cells). The maximum change occurs about 4-5 hours after irradiation ; there is usually a return to normal within 4-5 days. The red cell count and hæmoglobin content show increase after irradiation, particularly when sub-normal at the outset.

The erythema-producing rays, in normal dosage, evoke a rise in the bactericidal power of the blood. (It is stated that over-dosage may reverse this effect) (92). Probably associated with this factor is the increased resistance to infection of various kinds, e.g., staphylococcus (106), colds (273), diphtheria (91), which follows actinic irradiation. Huntemüller (109) has measured a three-fold increase in the alexines after light baths.

Other recorded changes in the blood picture after irradiation include :—Reduction in alkalinity (96) ; shortening of bleeding time (102) ; increase in serum mineral content (calcium, phosphorus, iron, iodine) ; decrease in blood sugar.

Associated with the vascular dilation is a reduction of high blood pressure, often considerable in extent (796).

It cannot be said that the important subject of blood reactions is yet satisfactorily understood. References [89–112] (page 29) will assist further reading.

Effects on Metabolism.

Actinic irradiation with the short ultra-violet rays (below 3020 A.U.) creates Vitamin D in the human body, raises the serum content of calcium and phosphorus, and promotes the fixation of these minerals in the body. It is thus of special value in conditions of calcium deficiency (rickets, tetany, osteomalacia) and during times of abnormal calcium demand (e.g. pregnancy).

Irradiation produces other changes in metabolism, likewise important in their results but less well explained. Some are probably indirect effects of exposure to light, conditioned through the sympathetic nervous system. There is considerable discordance between different observers' reports, due probably to inevitable differences in subjects, sources, intensity of exposures, and other variables.

Respiration is decreased in frequency and increased in depth, with a net rise in minute-volume. Intake of oxygen and output of CO_2 show increase.

Both anabolism and catabolism appear to undergo stimulation through light. This leads in practice to the paradox that irradiation will both reduce obese and develop thin subjects.

Irradiation has also considerable effects on the carbohydrate metabolism. There is increase both in mobilisation and combustion of blood sugar, and parallel to this proceeds a reduction both of glycosuria and of acetone body excretion in diabetic subjects.

For some days following a general light bath, there is considerable increase in excretion of nitrogen, phosphorus, sulphur and salt, indicating enhanced activity in albumen metabolism. Many reports indicate increased fixation of iron after irradiation, and the iodine content of the thyroid also shows some rise.

Ultra-violet radiation has a stimulating and regulating effect on the endocrine glands, and assists the production of hormones. Thus, the effects of endocrine therapy are increased by concurrent irradiation.

General.

Among the physiological effects of irradiation should also be mentioned its effects on the nervous system. It acts on the sympathetic system, and so affects the respiration and the endocrine glands. Again, it has marked analgesic effects, probably due to action of the rays on the peripheral nerve terminals.

The following summary of physiological reactions is given for reference :—

(*a*) *Direct Effects.*

Direct bactericidal action on *surface* infections.

Stimulus of skin cells and increase in their oxygen-metabolism.

Release of endogenous proteins and other substances into circulation (after severe dose).

Formation of vitamins or pro-vitamins.

Erythema, some hours after irradiation, with dilation of the superficial blood vessels, increase in skin temperature and vasomotor activity. Erythema is not usually observed in infants.

Improvement of skin tone, and increased firmness and development of the underlying musculature. Increased "esophylaxis" (anti-body forming function of the skin).

Stimulation of the skin functions (transpiration, heat regulation, resistance to infection).

Pigmentation (after a series of increasing exposures).

(*b*) *Effects on the Blood through the Skin.*

Increased content of calcium, phosphorus, iron and iodine.

Increase in the bactericidal power (originating locally in irradiated area).

Increase in hæmoglobin and red corpuscles.

Lymphocytosis and leucocytosis.

Normalization of blood pressure.

(*c*) *General Effects on the Body.*

Increased metabolism, shown in improved appetite and sleep, increased assimilation and diuresis.

Marked mental stimulation, through action on the central nervous system.

Reduction of pain through analgesic effect on the peripheral nervous system.

Deepening and slowing of respiration, with increased expiration of carbon dioxide.

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CHAPTER III.

Dosage

To win the patient's understanding and co-operation it is helpful to explain briefly that actinotherapy is the therapeutic use of rays similar to those found in sunlight, but of greater intensity; that these ultra-violet rays have powerful bio-chemical effects, raise the bactericidal power of the blood, and increase resistance to infection. (See the useful notes given by Dr. L. C. Donnelly in his paper "How I use ultra-violet energy," No. [832]). A brief talk can be suited to the circumstances of the case. Explain that little or nothing will be felt during the actual treatment, *and advise what reaction will follow*. If this is expected to be severe, prescribe suitable alleviatives (see page 40). Stay in attendance with each patient during the early treatments.

When actinotherapy is first administered in chronic conditions, the first results may be reinoculation of the patient and a temporary exacerbation of symptoms. This is frequently observed and is usually a good prognostic sign.

Records.

Time and distance of each irradiation should be noted on the case-record card, and the resulting reaction entered at the next visit.*

Individual Treatment.

In private practice, it is most convenient to treat the patient on a couch. If not over 20 inches high this allows the Alpine Sun burner to be raised 40 inches from the patient. Keep the treatment room warm (70-75° F.), or use the Sollux Lamp for warming the patient. The operator and

**Special Record Cards for Light Treatment are supplied by the Hanovia Co. through its dealers and agents.*

any attendants must wear goggles; the patient should also do so, but may be allowed to dispense with them provided the eyes are kept shut.

Have the lamp in position by the couch before switching on. The burner should *not* be directly over the patient. When it is running *at full output* the patient, undressed, lies flat on the couch and the timing clock is started. If back and front are being irradiated 2 minutes each, set the clock for four minutes and instruct the patient when to turn over.

The skin should be quite clean, divested of grease, powder, etc., before treatment. A hot bath or shower will both cleanse the skin and improve its circulation, thus promoting the actinic reaction. Loin slips are often worn during treatment; except for these, the greatest possible area of skin should be exposed for tonic irradiation.

Collective Treatment.

In large scale clinics using the Jesionek Lamp, patients are usually treated standing or sitting. Distance of exposure is regulated by graduated circles marked on the floor, and it is a simple matter to ascertain the time for an average erythema reaction at each distance. Take individual tests to ascertain any personal idiosyncrasy, so that patients can be grouped for treatment suited to the needs of each case.

Dosage.

Several factors must be considered in correct dosage. These include :—

Apparatus — quality and intensity of radiation emitted.

Exposure, considered under :—
  (*a*) Distance (from lamp to patient).
  (*b*) Time of exposure.
  (*c*) Area of skin exposed to the rays.

Frequency of irradiation (intervals between exposures).

The patient, with special regard to :—
  (*a*) Constitutional factors.
  (*b*) Condition, ascertained after diagnosis.

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It is impracticable to standardize technique in terms of minutes and inches, in view of the number of variant factors. So far as any indications for exposure are given here, e.g., on the Erythema Chart (page 42), they should be understood as referring to a patient with an average skin reaction and to a Standard Alpine Sun burner (A.C. type, *or D.C. at* 200-250 *volts*) of 1932 type which has been used not more than 100 hours.

Apparatus.

In this handbook, the technique of ultra-violet irradiation is standardized on erythema reactions (see below). The practical test of an actinic source is its power to evoke an erythema on the skin in reasonable time. If, on test, a lamp does not fulfil this condition, it should be renewed or replaced. For clinical work, it is essential to standardize the lamp output at intervals.

The Standard Alpine Sun and Kromayer Lamps are less powerful when set to operate on low voltage Direct Current circuits. Compared with the higher voltage models, these lamps would require about 50 per cent. increase in exposure. As the standard voltage in the United States is 110, over-dosage would result from applying the time and distance factor stated by American writers to high voltage lamps without correction.

The practitioner should, at the outset, and periodically, standardize his own lamp by skin test, preferably on himself. This will ensure that he is familiar with the various degrees of erythema reaction, and repetition of the test (say, after each 100 or 200 hours of burner use) will obviate errors due to differences in personal reactions. A simple and practical method is as follows :—

Air-cooled Lamp.

Light the lamp and allow it to burn for 10 minutes (Standard Alpine, until operatometer needle is steady). Then take a series of five exposures on the inner forearm, at a uniform distance of 10 inches from the burner. Each exposure should be made through an aperture about half-an-inch in diameter, keeping the rest of the skin covered. Convenient times are 1, 1½, 2, 3, 6 minutes. On the following day observe the result, and repeat at 40 inches distance for times of 3, 5, 10 minutes. If the forearm is pigmented such tests should be made on the abdomen.

Kromayer Lamp.

Using the same method, after the lamp has burnt 5 minutes, hold the window in contact with skin of inner forearm for 10 seconds, at other spots for 25 seconds, 40 seconds and 1 minute. Next day repeat (on other arm) at 2 inches distance, for 30 seconds, 1, 2 and 5 minutes. Use a sheet of paper with cut aperture for these distance irradiations.

The reactions, 1-2 days later, make it easy to standardize the erythema output of a lamp, in terms of a personal reaction. Keep a record of time, distance, and reaction, and repeat the tests when the lamp has given 100 hours operation, then after 200 hours, and so on. Thus you arrive at factors expressing the intensity of a lamp in terms of its erythema production.

Sollux Lamps.

These lamps produce no erythema and no latent reaction. Their therapeutic effect is an immediate deep-tissue hyperæmia.

Exposure.

(*a*) *Distance.* For convenience of measurement, a distance gauge is manufactured for use with any model of the Alpine Sun Lamp. In large clinics using the Jesionek Lamp, it is useful to fix lamp distances by white lines permanently marked on the floor.

Whilst the mercury arc is not a point source of radiation, the inverse square law is roughly true for the intensity of its radiation.* Note that this does not apply to the *quality* of the rays; due to differential absorption by air, irradiation from a short distance (10 inches) has a greater proportion of short-waved, counter-irritant, bactericidal rays than from 30 to 40 inches. Sampson (786) distinguishes between long-wave and short-wave technique on the distance basis alone.

The following reference table shows the relative intensity of uniform time exposures given at different distances :—

Distance (inches).	40	31	26	22	20	17	14	12	10
Proportionate Dose.	1	1½	2	2½	3	4	5+	7	9

(*b*) *Time.* Timing clocks are essential in the treatment. They should be specially made to ring a signal at the end of a set period which can be accurately measured in minutes. There are two standard Hanovia timers made in this way : the Large Timer (setting up to 30 minutes), and the Small Timer which sets to 6-minute intervals.

(*c*) *Area of skin exposed.* This is a dependent variable. In most conditions for which general body baths are prescribed, as much of the body surface as possible should be exposed to irradiation at each exposure. Special conditions (e.g. angina pectoris) indicate a sharp reaction over a limited area ; Part II of this book gives details. The blister dose (fourth degree erythema) is never given except on a very small area.

Eidinow (147) states that maximum increase in hæmo-bactericidal power is produced by irradiating only one-fourth of the body area at a time with a minimal erythema exposure three times weekly. As a working procedure, however, this does not appear to have found general acceptance.

**For more accurate calculation of the dose at varying distances, the formula :—*

$$I = \frac{t}{d^{1 \cdot 6}}$$

is considered valid for the air-cooled burner with reflector, and has been used in calculating the table on page 35.

Frequency of Irradiation.

Intervals between treatment will vary according to the condition present and the severity of any previous skin reaction. As a general rule, do not apply repeat irradiation until the previous reaction has subsided. Authorities vary widely in their procedure for courses of light treatment, and some attempt is made below to clarify this matter by instancing typical courses of general irradiation.*

Tonic Course.

Dose.	Distance (inches).	Time (minutes).	Interval (days).	Relative Dosage.	Skin Reaction.	Remarks.
1	40	3	2–3 days interval between treatment.	1	First degree erythema.	Visible erythema at first exposure, then time increased gradually at constant distance.
2	40	4				
3	40	5				
4	40	6		2		
5	40	7				
6	40	8				
7	40	9		3		
8	40	10				
9	40	11				
10	40	12				
11	40	13		4		
12	40	14				
13	40	15		5		
14	40	15				
15	40	15				

(Do not increase over this time or decrease standard distance. If pigmentation results, intermit treatment 3-4 weeks and recommence with initial dose).

Typical Conditions. Neurasthenia, digestive disorders, anæmia, hyperpiesis.

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* *It is appropriate to emphasize here that these times and distances are not hard and fast guides. The patient's reaction to any irradiation gives the best guidance for correct exposure at the next treatment.*

Sedative Course.

Dose.	Distance (inches).	Time (minutes).	Interval (days).	Relative Dosage.	Skin Reaction.	Remarks.
1	40	1–2	Given daily or every second day.	Constant.	Sub-erythema.	The very slight reaction is repeated at each exposure, avoiding any pigmentation.
2	40	1–2				
3	40	1–2				
4	40	1–2				
5	40	1–2				
6	40	1–2				
etc.						

Typical Conditions. Severe anæmia, asthma, debility, convalescence.

Therapeutic Course.

Dose.	Distance (inches).	Time (minutes).	Interval (days).	Relative Dosage.	Skin Reaction.	Remarks.
1	40	3	1–3 days interval between treatment.	1	2nd erythema.	Definite erythema to be produced after each exposure. After 12 sessions interpose 3–4 weeks break.
2	38	6		2¼		
3	36	9		3½	pigmentation.	
4	34	12		5		
5	32	15		7		
6	30	18		9		
7	28	21		12		
8	26	24		15		
9	24	27		20		
10	22	30		26		
11	20	30		30		
12	20	30		30		

Typical Conditions. "Surgical" tuberculosis, rickets, neuralgia, skin diseases, endocrine deficiency.

Note. If an accidental break occurs during the course, take the last dose given and count the break period backwards ; e.g., if two weeks break occur after No. 6, recommence with No. 3 (given two weeks before the break).

The Patient.

Constitutional Factors. In fixing the initial dose, the best procedure is to ascertain each patient's sensitiveness by previous tests on small areas. There are wide variations due to :—

Sex. Women require about 75 per cent. of the dosage applicable to males.

Age. Children require about half the adult dose ; infants about a quarter. (*Note.* Infants up to 3 years old may not develop erythema reaction).
Caution is necessary with elderly patients.

Skin. Tanned skins, dark complexions, thick fatty skins, all indicate increased dosage. Fair skins, red hair, special sensitiveness to sunlight indicate caution and a small starting dose. Albinos will probably react to a minimal dose. Long-standing syphilis or malaria may cause violent reactions.

Weight. Some experts state that muscular and corpulent subjects show best results when irradiation is given frequently and dosage steadily increased, whilst those patients of active nervous temperament react best to smaller doses once or twice weekly only.

Body area. Different areas of the body surface react differently to actinic rays. Bach gives a useful table of relative sensitivity as below :—

100 per cent.	Abdomen, chest, back, pelvis.
75 ,, ,,	Inside forearm, outside arm.
50 ,, ,,	Neck, face, thigh, calf.
25 ,, ,,	or less. Hands, soles of feet.

Special Factors. Hypersensitive patients are rare, and will usually be aware of their idiosyncrasy to natural sunlight.

Reaction will also be increased by any measures which promote skin-circulation, such as hot baths, luminous heat, massage, etc., applied *before* irradiation. It is poor technique to irradiate a skin that is cold and sluggish.

Erythema.

The skin erythema following ultra-violet radiation develops after a latent period which may vary from one to eight hours. It is a skin flush accompanied by vascular dilation. The degrees usually distinguished are the following :—

Sub-erythema. No visible reaction, the dose being determined as one quarter of the second degree erythema.

Synonym : "Sedative dose."

1st Degree. A reaction so slight that it is scarcely noticed by the patient. The skin reddening is very faint, occurs after a latent period of some hours, usually subsides within one to two days, and is not followed by visible exfoliation. Should be administered on the entire body, or largest possible area.

Synonyms : "Ultra-violet douche" ; "Minimal erythema dose" ; "Tonic dose."

2nd Degree. A mild sunburn reaction. The reddening is plainly visible and is followed on subsidence by slight granular exfoliation. Subsides in about three days, leaving some pigmentation.

Synonym : "Stimulative dose."

3rd Degree. An intense reaction similar to severe sunburn. The reddening is intense and the epidermis can be peeled off in large strips. Takes about a week to subside, leaving pigmentation. Essentially a local reaction.

Synonyms : "Regenerative erythema" ; "Counter irritant dose" ; "Inflammatory stimulus."

4th Degree. An intense reddening, supervening after a short latent period (about two hours) and deepening until exudation and blistering result ; persists for many days. Only administered on small areas. Usually administered at contact, or short distance, and is thus also a bactericidal or sterilizing dose.

Synonyms : "Dermatitis bullosa" ; "Destructive dose"; "Acute inflammatory stimulus."

The erythema chart (page 42) gives data which will assist in correlating any required degree of erythema with the exposure factors. It should be carefully studied, but not blindly adopted as a hard and fast rule without regard to the patient.

Demarcation.

It is simple to limit actinic reaction to any required body area, by covering the areas not to be exposed. Black paper cut to shape, plaster, etc., may be used. A very handy preparation is "Protectol"* ointment which can be used for protecting the nostrils, labia, and other areas not easily covered in other ways.

Alleviation.

Any slight irritant following an ordinary tonic dose is easily alleviated by applying boracic or talcum powder. For more intense erythema, cold compresses (resorcin, aluminium acetate, boric lotion, calamine lotion, etc.) or ointment ("Hanoviol,"* 2 per cent. salicylic ointment, zinc oxide, etc.) may be applied. Where heavy reaction has been caused in a cavity (nostrils, etc.) a soothing suppository may be made up as below :—

Al. acet. (bas. sol.)	5
Lanoline	10
Vaseline alb.	20

If applied immediately after local overdose of actinic rays, irradiation with the Sollux Lamp, using the localizer and red filter, applied for 15-30 minutes, will obviate an undue skin reaction (see page 51).

Contra-indications.

Contra-indications for phototherapeutic treatment include all those pathological conditions where the organism is incapable of summoning resources to make a reparative effort under the influence of ultra-violet rays.

This is the case with almost all the cachexias and acute febrile diseases (congestive tuberculosis taking the first place). Ultra-violet appears equally contra-indicated in all the cases where the patients have to be maintained in complete repose. For example, gross renal, hepatic, or cardiac insufficiency.

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* *Supplied by the Hanovia Co., and Agencies.*

Under this heading must be included :—

Conditions of auto-sensitization (scarlet fever, small-pox, measles, pellagra, beri-beri, xeroderma, hydroa aestivale, Addison's disease.

Advanced arteriosclerosis.

Advanced heart disease with failure of compensation.

When there is any doubt whether actinotherapy should be administered, small doses should be the rule, and careful observation should be kept of pulse, temperature, and weight.

Photosensitization.

Certain drugs, dyes and heavy metals cause photo-catalytic reactions when present in the system during actinic irradiation. In the hands of experts, some of whose publications are noted (page 44), this phenomenon has been utilized in therapeutic irradiation. Whilst photosensitization is not yet a widely used or fully understood procedure, the practitioner should be familiar with the commoner substances which evoke it, as cautious dosage of actinic rays is indicated when these are being administered :—

Drugs. Quinine, trypaflavin, eosine, chlorophyll, pyridine, gonacrine, methylene blue, and the other fluorescent dyes.

Endocrines. Insulin, adrenalin, pituitrin, thyroid.

Metals. Heavy metals circulating in the blood increase the effect of ultra-violet rays. Again, the effects of drug therapy in which these metals are administered are distinctly increased under the influence of the rays. This applies to mercury, iron, bismuth, gold, silver, etc., and especially to calcium and its salts.

Desensitizers. It is stated that ingestion of the following substances retards actinic reactions :—

Resorcin (3 grains, taken one day before irradiation).
Camphor and its derivatives.

ERYTHEMA CHART (FOR FIRST EXPOSURE)

Degree.	Reaction.	Notes.	Time and Distance Factors for Initial Dose (*Stated for* 200-250 *volt lamps of* 1932 *types.*)							
			Standard Alpine Sun Lamp			**Standard Kromayer Lamp**			**Kromayer Lamp Model II**	
			10 ins.	30 ins.	40 ins.	Contact.	2 ins.	6 ins.	Contact.	2 ins.
Sub-Erythema.	No visible reaction.	"Sedative Dose." May be repeated daily on entire skin area.	Usually taken as ¼ of the 2nd degree erythema dose, ascertained by test.			—	—	—	—	—
First.	Very slight; causes no subjective symptoms. Reddening of skin scarcely visible and disappears within 24 hours.	"Tonic Dose." May be administered on entire body and repeated daily, or every second day.	—	1½ mins.	2½ mins.	—	—	—	—	—
Second.	Symptoms of mild sunburn. Reddening is visible and followed by granular exfoliation.	"Counter irritant dose" Two-three day intervals before repetition.	—	3 mins.	5 mins.	25 secs.	1 min.	10 mins.	1 min.	4 mins.
Third.	Symptoms of severe sunburn. Reddening intense. Skin will peel off in large strips.	"Stimulant" or "Desquamation Dose." Usually administered on limited area only. Allow 4–7 days interval.	1 min.	6 mins.	10 mins.	40 secs.	2 mins.	15 mins.	3 mins.	10 mins.
Fourth.	Very intense reddening with oedema and formation of blisters in the epidermal layers.	"Bactericidal dose." Gives protein-shock reaction. Given on limited focus only. Repeated as required.	—	—	—	1 min.	5 mins.	—	5 mins.	20 mins.
			Note.—For D.C. 110 v. model add 50% to above exposures. Halve the above exposures for infants.			*Note.*—When the blue filter is used, allow 4 x above exposures. With rod applicators allow 2 x above exposures on skin, 3 x on normal mucous membrane.				

This chart is not a hard and fast guide. It is provided as a working basis only; each patient must be treated as an individual.

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Also Nos. 132 152b 789 (Chap. 13); 796 797 831 898

Applicators for the Kromayer Lamps

As a guide in selecting applicators, the standard forms in use are illustrated and briefly described below :—

No.		
*501	Round rod, 17×80 mm.	These are of general utility, e.g., for treating nodules, small ulcers, gingiva, conjunctiva, etc.
*502	Round rod, 12×80 mm.	
*503	Round rod, 5×80 mm.	For the auditory canal.
504	Wedge (adults) 10×80 mm.	Designed for nasal irradiation. These applicators have a centimetre scale etched on the quartz to assist in regulating exposure. Also useful for irradiating a narrow sinus.
505	Wedge (children) 8×74 mm.	
*506	Curved rod, 11×110 mm.	Laryngoscope, designed by Dr. Sampson for laryngeal tuberculosis. Also used in dental surgery for gingival irradiation on lingual aspects.
507	Hooked rod (spatulate tip) 8×150 mm.	Introduced by mouth for irradiation of naso-pharynx.
508	Rod (flattened at tip) 6×140 mm.	For irradiation of nostrils and posterior nares; deep sinus work, etc.
*510	Rod (with forked end) 12×120 mm.	Dr. Hindley-Smith's special tonsil applicator.
522	Socket disc.	This (with No. 523) is essential for fixing any applicator to the Kromayer Lamps. It embodies a three-way lever giving white (unfiltered) light, blue light, or cut-off, as required.
523	Holder.	For the Standard Kromayer Lamp, used with No. 522 for attachment of any rod applicator.

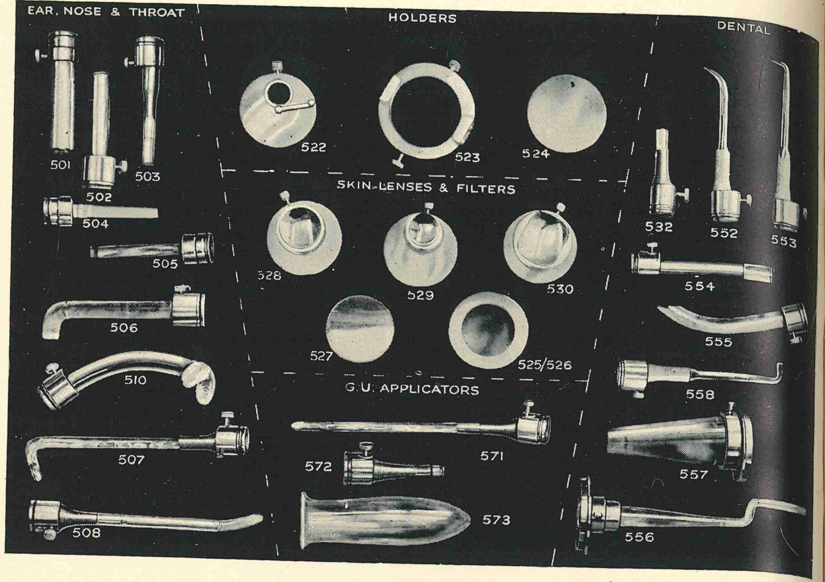

FIG. 3.

Applicators for the Kromayer Lamps

The technique of irradiating the membranes which line orifices of the body necessitates applicators of suitable design. The forms here illustrated are, in nearly every case, designed by specialists in the various branches of medical work under which they are classified. Details of dimensions and uses are stated opposite.

The specifications of applicators given under the different indications in Part II of this work are referred to the numbers here quoted.

523a	Holder.	For the Kromayer Lamp (Model II). Similar to No. 523.
524	Lens cover (metal).	For Standard Kromayer Lamp. Safety screen for use when lamp is lit, but not being applied.
581	Lens cover (mica in metal frame).	For Kromayer Lamp (Model II). Serves same use as No. 524.
525	Uviol blue window (in metal frame).	For Standard Kromayer Lamp. Applied in front of the lamp window. Cuts off the shorter ultra-violet rays (below 2800 A.U.) giving a milder radiation with deep penetration. Necessitates about four times the exposure of unfiltered radiation. (See pages 14, 46).
525a	Blue window (in metal frame).	For Kromayer Lamp (Model II). Same purpose as No. 525.
526	Diagnosis filter (in metal frame).	For Standard Kromayer Lamp. Applied in front of the lamp window. This filter serves for fluorescence—diagnosis of skin infections, e.g., ringworm. (See pages 14, 142).
526a	Diagnosis filter (in metal frame).	For Kromayer Lamp (Model II). Same use as No. 526.
†527	Crystal quartz window.	(Spare part for the Standard Kromayer Lamp). To be inserted with the bevel edge outward.
†528	Medium Skin Lens, 28 mm. ϕ.	Used in compression treatment for dehæmatization and deep penetration.
†529	Small Skin Lens, 20 mm. ϕ.	
†530	Large Skin Lens, 30 × 34 mm.	
532	Round rod, 8 × 50 mm.	For gingival work.

*552	Round rod with half bend, 5 × 100 mm., tapered tip.	Pyorrhoea applicators, for penetration of pus pockets. Also valuable in ophthalmic work to irradiate conjunctival fornices, small ulcers, etc.
*553	Round rod with right angle bend, 5 × 100 mm., tapered tip.	
*554	Round rod, 12 × 100 mm.	For facial aspects of gingiva and irradiation of small foci elsewhere.
*555	Curved rod, 12 × 120 mm.	For lingual aspects of gingiva and other oral lesions.
556	Bayonet rod, 6 × 170 mm.	Designed by Dr. Zilz for irradiating oral lesions of difficult access.
†557	Conical oral applicator, 100 mm. long, tapering to 15 mm. ϕ.	This applicator gives heavy concentration of the rays on a small area, ensuring heavy reaction with short exposure.
*558	Right angle rod with bulbous tip, 8 × 110 mm.	Primarily for irradiation of tooth sockets after extraction.
571	Rod, olive shaped tip, 6 × 170 mm.	A long rod for urethral irradiation, also valuable for empyema and deep fistulæ.
572	Rod, 5 × 70 mm.	A general utility rod applicator.
573	Quartz speculum, small, 32 × 112 mm.	For vaginal irradiation. The speculum is placed in the patient first and lamp brought up. A rod applicator affixed to the lamp can be used within the speculum to irradiate small ulcers, etc. The small speculum is also used for rectal irradiation in a similar way.
574	Quartz speculum, medium, 32 × 118 mm.	
575	Quartz speculum, large, 38 × 112 mm.	

**Rods thus marked are designed for localized reactions from their tips, and the quartz is metal-covered to obviate lateral radiation.*

† These applicators are ground from crystal quartz, and must be sterilized cold with alcohol, etc. All other applicators are of fused quartz and may safely be sterilized by boiling. Remember that the ultra-violet rays are themselves powerful bactericidal agents and will quickly destroy any germs on the window or rods.

CHAPTER IV.

Dosage *(Continued).*

Local Irradiation.

1. *Kromayer Lamp.*

It should be remembered that local irradiation with the Kromayer Lamps is a different procedure to treating a small area with the air-cooled models. The shorter ultra-violet rays, which have most powerful bactericidal properties, are readily absorbed by air. With the Kromayer Lamps, the radiation penetrates only $\frac{1}{2}$ inch of water. This filters out the infra-red rays, but transmits the ultra-violet rays above 2000 A.U. practically unweakened.* Application of window or rod in contact means utilizing these short bactericidal rays in full intensity.

In distant irradiation, the Standard and Model II Kromayer Lamps should usually be applied about 2 inches from the skin surface, at right angles. If well defined, the lesion may be demarcated by plaster, or black paper cut to shape and applied to the skin. Remember that in treating ulcers, erysipelas, etc., it is essential to include a margin of healthy skin when giving treatment.

2. *Alpine Sun Lamp.*

To produce a second or third degree erythema on the scalp, face, a limb, etc., it is usually sufficient to cover the

**The diagram on page 18 shows the output of the Kromayer Lamp.*

unexposed areas and bring the Alpine hood to correct distance. Remember that the rays should always be directed at right angles to the treatment surface.

Lesions which are quite small, and where heavy reactions are not indicated, may be radiated through the aperture in the Alpine Sun lower hood. Do not apply the Alpine Sun at less than 8 inches burner-to-skin distance.

Compression Irradiation.

Ultra-violet rays are absorbed in the capillary blood vessels. When the skin is dehæmatized by compression, the rays penetrate into the deeper epithelial layers.

The quartz window of the Standard Kromayer Lamp may itself be applied directly to the skin in compression treatment. More effective dehæmatization is secured by compression through one of the skin lenses (Nos. 528-530).

Deepest penetration is obtained by using the blue filter in contact with the Kromayer Lamp window, and giving about four times the normal unfiltered light exposure to produce an equal degree of erythema.

Where a long exposure under compression is given, it is sometimes found convenient to bind the lamp burner firmly into position. When using this procedure with the Standard Kromayer Lamp, take care that the burner is maintained in correct position throughout treatment.

The lamp front can be sterilized after use by washing with sublimate solution.

Treatment with Applicators.

A quartz rod transmitting ultra-violet rays acts as a lens throughout its length. Practically the same quality and intensity of radiation which enters from the burner is emitted at the treatment end. The quartz rod obviates the losses in intensity and quality caused by air-transmission ; still more, it allows the beam to be deflected so that irradiation can be applied to foci (larynx, etc.) which are inaccessible to direct irradiation.

Book No. 159a

The successful use of the Kromayer Lamp depends largely on due employment of the applicators. Their various uses are described briefly below :—

Skin Treatment.

For the technique of dehæmatization for deep reactions following Finsen's procedure, use the skin lenses Nos. 528-530. Other forms of skin work require rod applicators of various thicknesses, e.g., for the irradiation of resistant infiltrations, small ulcers, etc.

Some forms of contact treatment (certain types of lupus, joint reactions in arthritis, etc.) are given through the lamp window itself applied directly to the skin. Using rod applicators, time to produce an erythema on the skin is found to be about double the exposure time for window-contact irradiation.

Membranes.

Normal mucous membrane will tolerate about 50 per cent. greater exposure than the skin of the abdomen, but great variations occur due to pathological changes. For example, the nasal membrane may require only 30 seconds exposure in cases of hay fever, but 10 to 15 minutes for ozaena.

When producing a heavy reaction in a cavity, measures should be taken to prevent blistering the skin (nostrils, labia, etc.) at its entrance. A practical way is to insert the applicator alone to the full length required, then grease the outside skin with "Protectol" or lanoline. Do not apply the grease first, or it will adhere to the applicator and interfere with treatment. After this is done, bring the Kromayer burner, ready lit and running at correct intensity, into position and affix to the applicator.

The notes given under the various conditions in this handbook, combined with the descriptions of applicators following, will enable the practitioner to select applicators suitable for treating all indications.

Sinus irradiation.

A deep, irregular sinus, fistula, or septic wound, may be irradiated by flooding the cavity with one of the photosensitive dyes and irradiating with the Kromayer Lamp and a suitable applicator (e.g., No. 571) dipping into the solution. The aniline dyes, eosine, acriflavine, gentian violet, fluorescein, in 1/1000 water or glycerine solution, are usually employed, or mercurochrome in suitable cases. Donnelly states that gentian violet has special affinity for staphylococci, streptococci, and anthrax ; and acriflavine for gonococci, the colon and dysentery groups.

References:

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Also Nos. 837 913

CHAPTER V.

Luminous Heat and Infra-Red Rays

On a strict definition, "actinotherapy" means the medical application of short, actinic, ultra-violet rays, and indicates the use of "cold" actinic sources such as the quartz lamp. Its meaning is, however, extended to include all forms of light treatment.

At the other end of the visible spectrum are the luminous heat and infra-red rays, generated by the Sollux Lamps. This group of radiations form a valuable complement to the ultra-violet rays. They have greater power of tissue penetration, and take immediate action. These "thermal" rays do not produce the powerful secondary physiological reactions characteristic of the photo-chemical "actinic" rays ; their effect is a deep penetrating hyperaemia of long duration. Locally, they produce a blood temperature exceeding the highest known fever, with consequent increase in the processes of oxidization and immunization (phagocytosis). This points to the indications for their therapeutic use in acute conditions associated with inflammation and pain.

Some conditions exhibit the best response under combined irradiation, in which both the actinic and thermal rays are utilized to reproduce the full range of sunlight. Frequently the heat rays are subsidiary : they serve only to warm the unclothed patient, to improve skin-circulation, and so prepare the way for a satisfactory actinic reaction. In certain conditions (e.g., rheumatism, neuritis) their action is essential to relieve the acute symptoms, whilst the subsequent actinic reaction assists to rebuild tone and promote recovery.

The Sollux Lamp generates, in addition to invisible infra-red, a proportion of visible red and yellow radiation.

Its output characteristics are reproduced on the special graph (page 18) with which is correlated a graph of the comparative tissue-penetrating power of different wave-lengths. Red light, and the shorter infra-red rays, are the most penetrative of all wave-lengths employed in light therapy ; comparison of these graphs makes this evident. The longer-waved infra-red do not reach the underlying tissues, and tend to overheat the skin when applied in excess (177).

The red filter with the Sollux Lamp produces a radiation with the maximum of deep penetrating rays in proportion to the other radiations present.

Technique.

The reaction to these rays is visible during treatment in the form of hyperaemia ; the irradiated area is deeply suffused with blood. Note that deep tissue hyperaemia reaction is the aim in most instances, and in producing this, precautions may be necessary to prevent superficial burns. These are obvious ; e.g., greasing the skin before the first treatment ; cooling the skin by an electric fan during irradiation, etc.

Local Irradiation.

Either the Standard Model (1000-watt bulb) with localizer fitted, or the small model (300-watt bulb) may be used. The technique is similar for both lamps, but the Standard Lamp will naturally produce speedier results.

When using the Standard Lamp for local treatment, do not switch on full intensity. Move the resistance setting back to stud 4 or stud 3, otherwise internal overheating may destroy the bulb. Never cover the lamp with draperies.

Place the patient in a comfortable position, preferably reclining, and adjust the lamp so that the rays are concentrated on the focus of the inflammation to be treated. With the Standard Lamp, attach the localizer.

The distance of skin from the cork ring of the reflector should be as short as the patient can tolerate without discomfort. In practice this is found to be about 6 inches for the first treatment, which can be reduced to 3 or 4 inches at subsequent sessions. Delicate skins (e.g., young children, blonde females) may necessitate precautions as outlined above to prevent superficial burns.

To produce the required deep tissue hyperaemia, prolonged irradiation is essential. The first treatment should be not less than 20 minutes, and local irradiation may safely be prolonged up to an hour at each session. Local treatment may be repeated daily, or twice daily, or even more frequently in acute conditions.

Precautions. When irradiating the face, the eyes should be protected by the use of cloth pads, or special goggles proof against infra-red rays. The patient should avoid exposure to cold or draughts soon after treatment.

General Irradiation.

Use the 1000-watt Model Lamp. If a special region requires treatment (e.g., the thorax in pleurisy or pneumonia) demarcate by clothing, etc. Distance should be the shortest possible consistent with uniform irradiation over area. Maximum time 60 minutes each session.

In giving combined heat and ultra-violet therapy, always administer luminous heat before or during the actinic radiation. The eyes should be shielded from the rays.

The Colour Filters.

Red light is stated to be "antagonistic" to ultra-violet rays in its therapeutic action. Thus a local overdosage of quartz light can be counteracted by local irradiation for at least half-an-hour with red light ; this will obviate the blistering and severe pigmentation which would otherwise follow.

The therapeutic indications for red light are :—

(1) After-treatment of local actinic overdosage. In such conditions as seborrhoea and acne where it is necessary to bring about severe reactions with the quartz lamp, after-treatment

with red light will effect quicker restoration of healthy skin and obviate severe pigmentation ([164] [173]).

(2) For drying up acute weeping forms of eczema ([795]).

(3) For the treatment of pustular eruptions on the skin ; in such cases healing takes place without scars.

Blue light, used for prolonged local irradiation, is stated to cause local anaemia. It has been used :—

(1) For pre-operative treatment, to cause local anaesthesia (assisting cocaine, etc.).

(2) As an anodyne in articular and traumatic extravasations.

(3) For treating trigeminal neuralgia and acute coryza.

The Daylight Filter has no therapeutic value, but is useful in dental and surgical practice for diagnosis and other purposes which necessitate a colour-true light.

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Part II

INDEX OF CONDITIONS AND DETAILS OF TECHNIQUE

Part II

Abscesses.

Marked success is obtained in aborting the pathological process. If the case be treated before pus has formed, one local erythema reaction will usually be sufficient. When pus is forming, luminous heat therapy (Sollux Lamp) may effect resolution and save incision.

Technique. **(Incipient Abscess).** 3rd degree erythema with Kromayer Lamp and suitable applicator (e.g., No. 529) in contact with centre of lesion, followed immediately by distant irradiation through Kromayer window, 2–3 inches away, on area about 2 inches diameter, to sterilize follicles. Repeat only on subsidence, if required.

(Established Abscess). Produce brisk hyperæmia with Sollux Lamp, using localizer, to point of tolerance (e.g., 30 minutes at 6 inches distance). Repeat daily, or even more often, until resolution occurs.

(Chronic Abscess). Establish drainage and administer local 2nd degree erythema through Kromayer Lamp window. Repeat on subsidence until healed.

Concomitant therapy. Tonic measures, including suberythema light baths with Alpine Sun Lamp : especially in chronic (tubercular) abscess cases.

References: 165 793 (Tubercular abscess) 822 894 911

Literature references are given in full once only in this book and are numbered consecutively for easy consultation.

It is not sufficient to refer only to the special books and papers quoted under each condition. The additional references contain much valuable information and should always be consulted.

Acidosis.

This condition is very favourably influenced by actinotherapy, which produces a shift in the p.H value of the blood, rendering it more alkaline. A basic diet must be prescribed ; Dr. W. K. Russell uses a fat-free diet containing large amounts of glucose.

Technique. Alpine Sun Lamp, general irradiation, 1st degree erythema ; continue as Tonic Course (page 36).

References: 790 797

Acne Rosacea.

Results from actinotherapy are usually brilliant. Treat also the underlying cause (digestive disorders, alcoholism, genital disease), or relapses may occur.

Technique must be suited to the stage which the condition has reached.

Hyperæmic Type. 2nd degree erythema with the Kromayer Lamp, repeated after exfoliation until lesions are cleared up.

Hypertrophic and Telangiectatic Types. 3rd degree erythema through Kromayer window with firm compression ; and repeat on subsidence until cleared. Kromayer (159a) recommends the blue filter.

References:

[179] Stein, R. O.—*Ärztl. Praxis*, 15th November, 1928.

Also Nos. 159a 793 795 885

Acne Vulgaris.

Actinotherapy gives excellent results in all forms of acne, although relapses sometimes occur, and certain forms require concomitant measures.

Treat the patient for any underlying disorders, particularly constipation or anæmia, and prescribe an alkaline diet. Caution the patient that a sunburn reaction will be produced, to obviate anxiety.

Technique. 2nd degree erythema reaction with Alpine Sun Lamp to produce desquamation on all affected area. On face, treat each profile separately, and see that whole forehead to roots of hair is exposed. Eyes to be closed but not covered by goggles ; protect the ears if necessary. Repeat the 2nd degree reaction (increasing exposure as required) on subsidence, until the skin is thoroughly clear. Resistant infiltrations may need local third degree reactions with the Kromayer Lamp and applicator in contact, repeated as needed. For best cosmetic results, produce a local hyperæmia (Sollux Lamp; red filter if practicable) on the irradiated area each time immediately after treatment.

In ***Pustular Acne*** it is well to evacuate pustules before irradiation, and cleanse with alcohol. Some authorities (Thedering, Sibley, Donnelly) recommend X-rays, in combination with actinotherapy, for resistant nodules.

References:

[180] Donnelly, L. C.—*Amer. Jnl. Phys. Therapy*, February, 1926.

Also Nos. 786 792 793 795 837 838 844 855 885 888 894 898 907 909

Acrodynia (*"Pink disease"*).

Actinotherapy gives "the best and most dependable results in this condition" (182). The infants become quieter, perspiration decreases, appetite is regained, and a normal condition slowly established.

Technique. Alpine Sun Lamp, general light baths on lines of Tonic Course (page 36). Sollux Lamp for auxiliary warmth before each Alpine Sun bath.

References:

[181] Sweet, G. B.—*Archives Ped.*, August, 1925 (*Quartz Lamp*, October, 1925).

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Adenitis, Tubercular.

(*See also Tuberculosis, Surgical.*)

In a large proportion of cases of primary adenitis the glands decrease in size under actinotherapy without other treatment. Irradiation is the "treatment of choice" in these conditions and the glands are usually reduced to a size that does not cause any noticeable deformity. Ulcerated and deep-seated glands with sinuses may call for intense and protracted radiation; possibly X-ray or surgical treatment in addition.

First Stage. *Enlarged hard nodes* and

Second Stage. *Glands approaching caseation.*

Technique. General tonic light baths (Alpine Sun Lamp), sub to 1st degree erythema dose, repeated every 2 or 3 days, combined with *general* luminous heat (Sollux Lamp).

Sollux Lamp *locally* on glands to produce hyperæmia and assist resorption, followed by application of the Kromayer Lamp to glands under compression, 3rd degree erythema, repeated on subsidence.

Third Stage. *Glands caseated or suppurating.* Incise and aspirate, following by light treatment as above. If sinus is already present, treat by special sinus procedure (Kromayer with applicator) detailed on page 48.

References:

[183] Brooke, C. R., *American Jnl. Electrotherapeutics*, November, 1924 (Abst., *Quartz Lamp*, February, 1925).

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Also Nos. 253 267 656 658 661 667 668 673 676 680 682 684 686 688 690 743 745 788 796 803 806a 812 824 835 843 851 853 912

Adenitis, Venereal (*see Chancroid*).

Alopecia (*areata and totalis*).

The aim in treatment is to stimulate the follicles to re-growth. Prognosis is best in recent cases, but age and long-standing disease are not contra-indications. The scalp must be scrupulously cleansed before treatment.

Technique. **(*Alopecia totalis*).** 2nd to 3rd degree erythema reaction on the affected areas. Nagelschmidt (195) uses Alpine Sun, 12 inches distance, 10 minutes exposure. Screen other parts (ears, forehead, neck, etc.) from the rays (cotton wool is recommended, to prevent sharp demarcation). See that the rays fall at right angles on the area; two or three exposures may be required.

Allay pain or oedema by suitable compresses (see p. 40).

Repeat this reaction every 2-3 weeks, increasing first exposures. Continue course for two to three treatments after re-growth is thoroughly established, or until it becomes evident that the follicles are dead.

(*Alopecia areata*). 2nd to 3rd degree erythema with Kromayer (or Alpine Sun) on each bald spot, treated separately, including a margin up to $\frac{1}{2}$ in. The healthy hair should be cut short (males) or carefully combed away (females) before treatment. Repeat the intense reaction every 2-3 weeks.

References:

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Also Nos. 786 789 888 894 896 898

Amenorrhoea.

Provided that the condition is not organic, or the result of X-ray therapy, it usually responds to actinotherapy.

It has been noted that actinotherapy often stimulates the menses, causing earlier incidence (795).

Technique. Alpine Sun Lamp, general body tonic dose; on abdomen and lumbar region, 1st degree erythema dose, combined with luminous heat from Sollux Lamp (and/or pelvic diathermy) to stimulate local blood supply. Repeat once weekly during 3 months until menses established.

(Some authorities also recommend intra-vaginal irradiation with Kromayer Lamp, speculum, and applicator).

References:

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Also Nos. 390 790 793 795 797 837 853

Anæmia.

For anæmia in adults actinotherapy is "almost specific." Considerable increase of red corpuscles and of hæmoglobin occurs after a short course of treatment. Diagnosis should be based on a blood cell count to differentiate leukæmic conditions.

Infantile anæmia (particularly under 18 months old) if severe, may be caused by a toxæmia. Do not expect results from actinotherapy alone in such cases unless the underlying cause is diagnosed and dealt with.

Technique. Alpine Sun, general light baths. The more severe the condition, the milder should be the irradiation; e.g., a bad case should be given sub-erythema doses ('Sedative Course'); as improvement sets in, these may be increased to 1st degree reactions. The general light baths should be administered daily or every second day.

References:

203 Mathieu, R. & Feldzer.—*Soc. de Pediatrics, Paris*, January 20th, 1925.
204 Jongewaard, J.—*Archives Phys. Therapy*, November, 1928 (Extract, *Quartz Lamp*, January, 1929).

Also Nos. 257 260 264 267 796

Anæmia, Pernicious.

Good results have been obtained in treating this condition, even with cases which were not receiving liver diet.

Technique. General irradiation with Alpine Sun on the lines stated for 'Tonic Course,' for a period of 2-12 weeks.

Concurrent sensitization with eosin administered ½ hour before irradiation (40 m.gm. by mouth, or 2 ccm. 2 per cent. solution intravenously) is stated to promote the systemic reaction.

References:

205 Langmead, F. S. & Wilson, C. M.—*Lancet*, April 28th, 1928.
206 Macht, D. I. & Anderson, W. T.—*Jnl. Pharmacology and experimental Therapeutics*, December, 1928.
207 Minnit, R. J.—*Brit. Jnl. Actinotherapy*, April, 1929.
208 Macht, D. I.—*Brit. Jnl. Actinotherapy*, February, 1931.

Also No. 848

Angina Pectoris.

Irradiations give a considerable and lasting degree of relief. Patients are freed from pain, enabled to walk, and to dispense with nitro-glycerine. Hasselbalch reports on 44 cases; Freund 80.

Technique. Alpine Sun. Produce 3rd degree erythema on left side of thorax. Expose limited area only, e.g., 1st exposure on chest, 2nd on side, 3rd on back. Start with 10-12 minutes at 30 inches, or more if skin is already pigmented. 2nd exposure 5-8 days later. Intervals 5-8 days at first; 10-14 days after 5th exposure. Course of 5-8 treatments, repeated after an interval of several weeks.

References:

[209] Hasselbalch & Jacobaeus.—*Berliner Klin. Ws.*, 1907.
[210] Freund, E.—*Wiener Klin. Ws.*, June 21st, 1928.
[211] Freund, E.—*Brit. Jnl. Actinotherapy*, November, 1930.

Also No. 790

Angioma (*see Telangiectases*).

Arteriosclerosis.

In the initial stages, actinotherapy improves the circulation, the head noises and dizziness disappear. Abnormal blood pressure is reduced ; appetite, sleep, and general fitness improve.

Contra-indications include long-standing cases with hardened arteries, serious heart trouble, and high blood pressure.

Technique. Alpine Sun Lamp, general body radiation, 1st degree erythema, repeated every second day on the lines of the 'Tonic Course.' Combine with usual dietic measures (Sansum's basic diet, etc.).

Sollux Lamp, on the areas of peripheral circulatory disturbance, to alleviate pain and assist normal circulation. 20-30 minutes on affected area, to easy tolerance ; repeat daily.

References: 791 796 828

Arthritis, Rheumatoid.

Dr. Percy Hall (215) states his opinion, based on hundreds of cases, that ultra-violet radiation alone, correctly administered, will afford benefit to the majority of sufferers, and effect lasting cure in a large proportion of cases.

Prognosis is best in early cases, but many joints given up as hopeless have been "restored to a degree of usefulness." Dr. Deck (576).

Technique. ***Acute Stage.*** Rest inflamed joints.

Local luminous heat (Sollux Lamp with localizer) applied to joint, close as tolerable, for 30 minutes minimum, to produce deep hyperæmia round entire joint, or as far round as possible. Repeat at least once daily during the acute stage.

General light baths with the Alpine Sun Lamp, suberythema reactions only. Sedative Course.

Chronic Arthritis. General luminous heat baths (large Sollux Lamp) on entire body or whole affected limb, to promote circulation, assist elimination, and relieve pain. 10-15 minutes each side, increasing as indicated.

Concurrent ultra-violet radiation (Alpine Sun Lamp) 1st degree erythema.

The combined light bath to be repeated 2-3 times each week for course of 10-12 treatments. After intermission, repeat entire course if indicated.

Ankylosed Joints. Kromayer Lamp (use blue filter for deep penetration) applied with firm compression all round joint, 4th degree erythema dose (6-8 minutes with blue filter). Produce and maintain bullous dermatitis and internal deep reaction all round joint by 4-5 inch doses within 2-3 days. Subsequent loosening enables passive and active mobilizing measures to be begun (831).

Concomitant Therapy. Elimination of focal sepsis ; diathermy and other physical measures as indicated.

References:

[212] Charbonnier.—*Jnl. Med. Paris*, No. 4, 1926.
[213] McFee, W. D.—*Phys. Therapeutics*, September, 1926.
[214] Roberts, A.—*Brit. Med. Jnl.*, January 29th, 1927.
[215] Hall, P.—*Brit. Jnl. Actinotherapy*, Jan.-April, 1927.
[216] Snow, M. L. H.—*Phys. Therapeutics*, May, 1928.
[217] Pringle, G. L. K.—*Brit. Jnl. Actinotherapy*, April, 1929.

Also Nos. 576 581 786 796 831 854 855

Asthma.

In a majority of cases, actinotherapy gives a very decided improvement or a relief. In a disease with such diverse responses to treatment, it is not surprising that different procedures are adopted by actinotherapists. Dr. Auld (225) uses, in combination with desensitizing measures (serum peptone injections) sub-erythema doses with the Alpine Sun, sometimes combined with intra-nasal local actinotherapy. Hollender and Cottle (857) adopt similar measures.

In France, Duhem (218) and others have cured infantile asthma with larger doses. The Drs. Biancani (223) have observed that relief commences only after an erythema has been produced. Wellisch (230) applies regional 2nd degree erythema doses on chest and back, divided into four areas treated in rotation.

Whilst due attention should be given to desensitizing therapy, calcium and thyroid administration, septic foci, etc., some patients respond to actinotherapy alone.

Technique. Alpine Sun Lamp, general body baths, sub-erythema doses (e.g., 40 inches, 2 minutes, increased by one minute each time up to 15 maximum). Repeat every 3 days; course of 6 weeks; 1 month break, then repeat course.

References:

218 Duhem, P.—*Paris Medical*, February 20th, 1926.
219 Saidman, J.—*Jnl. Med. Paris.*, June 30th, 1926.
220 Tixier, L. & Mathieu, R.—*Brit. Jnl. Children's Dis.*, July-September, 1926.
221 Bryce, A.—*Brit. Med. Jnl.*, March 19th, 1927.
222 Woodbury, F. T.—*Phys. Therapeutics*, August, 1927.
223 Biancani, E. & H.—*Brit. Jnl. Actinotherapy*, September-October, 1927.
224 Wilmer, H. B.—*Archives Phys. Therapy*, January, 1928.
225 Auld, A. G.—*Brit. Med. Jnl.*, June 1st, 1929.
226 Lautman, R.—*1er Congrés Internat. Actinologie*, July, 1929.
227 Hall, P.—"Asthma and its treatment" (1930).

228 Ledingham, U.—In Report of Asthma Research Council, 1930.
229 Auld, A. G.—*Lancet*, April 11th, 1931.
230 Wellisch, E.—*Med. Klin.*, No. 7, 1931.

Also Nos. 402 405 799 807 814a 857

Bed Sores (*see Gangrene, cutaneous*).

Blepharitis (*see Ophthalmology*).

Blood Pressure.

"Both diastolic and systolic arterial pressures are lowered by biological doses sufficient to produce slight erythema, and I regard this method as one of the best at our disposal for reduction of arterial pressures which are too high, and the raising of those which are too low." Dr. J. F. Halls Dally (834).

Contra-indications. Advanced cardiac disease with failure of compensation; advanced arterio-sclerosis.

Technique. Alpine Sun Lamp, general body baths, 1st degree erythema: Tonic Course.

References:

231 Gunther, B.—*Med. Klinik*, March 4th, 1928.
232 Marx, H.—*Klin. Ws.*, April 22nd, 1928.

Also Nos. 789 790 792 793 796 834 847 854

Boils, Carbuncles, Furunculosis.

"Heavy doses of the rays cause healing at a very much more rapid rate than by any other known method" (894). If the case is seen in the early stage, one third-degree erythema treatment will usually abort the pathological process. If pus has formed, incise and evacuate, following this with the erythema reaction. The result is speedy resolution, and relief of pain takes place within a few hours, with practical cessation within two days. Also irradiation of the surrounding skin destroys any staphylocci which have found lodgment in adjacent follicles.

Technique. Kromayer Lamp. Irradiate area 3-4 inches diameter with lesion in centre. Produce heavy 3rd degree reaction. Do not cover up the surrounding skin. Repeat in 2-3 days only if needed.

Alpine Sun Lamp. General irradiation and other measures to increase lowered general resistance.

Sollux Lamp after incision, using localizer and red filter for deep penetration. 15-30 minutes' irradiation on lesion to alleviate pain and effect thorough drainage. Follow this by mild irradiation locally with the Alpine Sun to accelerate healing.

References:

[233] Hustead, C. L.—*Archives Phys. Therapy*, January, 1928.
[234] Blatt, M. L.—*Archives Phys. Therapy*, October, 1928.

Also Nos. 178 793 822 853 894 903 908 914

Bronchitis : Bronchial Asthma.

The good results of light therapy in these conditions are due to the efficacy of deep hyperæmia produced by luminous heat in all forms of inflammation, coupled with the effects of actinic rays on the sympathetic nervous system. Septic *tonsils* (q.v.) or obstructive throat conditions should be remedied.

Technique. Sollux Lamp on front and back of chest, 20-30 minutes each. (The more acute the condition, the more powerful these luminous heat applications should be). Follow up with Alpine Sun Lamp : (*a*) 1st degree erythema reaction on chest ; (*b*) whole body radiation, sub-erythema dose. Repeat every two days, but as condition improves increase intervals up to seven days. 4-8 weeks course of treatment ; a repeat course (after 2-3 weeks interval) is sometimes required.

References: 178 267 807 819 831 853

Bruises and Hæmatomata.

Valuable results are obtained in local or general bruising from applying luminous heat for its immediate decongesting effects, followed by ultra-violet radiation as restorative treatment.

Technique. Sollux Lamp, with localizer if necessary, applied to produce hyperæmia. If area affected is small, 20-30 minutes at short distance using localizer. If area large, use with open reflector at sufficient distance for uniform irradiation, giving 30-45 minutes and repeating on back of body if affected. Follow with Alpine Sun (or Kromayer locally) 2nd degree erythema on affected area. Repeat at 2-3 day intervals.

References: 825 913 915

Bubo (*see Chancroid*).

Burns and Scalds.

Actinotherapy relieves pain more rapidly than any other method ; healing is more rapid and the resultant scar is finer (239). The technique is necessarily varied according to the extent of the lesion, and the patient's condition.

Localized Lesions. Kromayer Lamp. Wash the lesion clean with liquid paraffin ; remove any adherent fragments of dead tissue. Then cover the burn with a thin, even layer of liquid paraffin. This can be done by soaking a double layer of gauze in the oil, squeezing out excess, and laying it carefully over the burn and a margin of undamaged skin. When ready to irradiate, peel off the gauze by two adjacent corners, and make sure that the surface is fully and evenly covered with oil.

Irradiate with the Kromayer Lamp at a distance sufficient to cover the lesions and margins. Give mild dose (e.g., 30 seconds at 6 inches). Dress the lesion with a plain gauze pad soaked in paraffin. Repeat the irradiation daily, giving the same dosage. When epithelialization is well established, say, in 7 to 10 days, a slight increase may be needed if the rate of healing slows down. (Technique published by Dr. J. Peake, Royal Free Hospital, London (237 239).

Alpine Sun Lamp. General body baths, sub-erythema dose, continued as sedative course of irradiation.

Larger Lesions (affecting less than quarter of the body surface).

Alpine Sun Lamp. Treat the lesion as described above. When covered with the film of paraffin, irradiate with 1st. degree erythema dose (e.g., 2 minutes at 30 inches). Repeat daily.

If heavily infected when first seen, give 50 per cent. more than a 1st degree erythema dose, for the first treatment only, to promote cleansing. Continue with milder doses as above. Remember that newly formed epithelium is easily damaged by short bactericidal rays. The liquid paraffin acts as a filter ; if this is not used, only the mildest dosage should be given during the regenerative stage of the lesion, or the blue filter used for long-wave technique.

Large Area Burns (over one-third of total skin area).

The prognosis is considered hopeless. In a grave case like this, where you will have no opportunity to give a second treatment if the first fails, select two areas of normal skin—each a square foot—and give a 3rd degree erythema reaction on each. (Alpine Sun Lamp, 10 inches, 1 minute).

Immerse the patient, suspended on a blanket or other soft support, in a bath of tepid water. Give general irradiation (sub-erythema dose, 40 inches distance) on entire body, removing any charred fragments first, and shielding raw surface. Repeat this twice daily until the unburned skin shows a beginning reaction, in which case halve the time.

When the time comes to take the patient out of the bath use perforated oil silk to cover the granulating areas.

Use no grease of any kind on the lesions.

(*Condensed from "Practice of Physiotherapy," by Dr. C. M. Sampson,* [786]).

References:

235 Kessler, E. B.—*Archives Phys. Therapy*, June, 1926.
236 Lemariée, P.—*Rev. d'Actinologie*, May, 1929.
237 Peake, J.—*Brit. Jnl. Actinotherapy*, August, 1929.
238 Shillito, L.—*Brit. Med. Jnl.*, October, 1929.
239 Heald, C. B.—*Lancet*, November 9th, 1929.
240 Peck, W. S.—*Brit. Jnl. Phys. Med.*, November, 1931.

Also Nos. 763 786 848 852 915 919

Bursitis and Teno-synovitis.

Symptoms are greatly relieved by production of powerful hyperæmia round the lesion. In suitable locations, this reaction can be brought to the regenerative stage by compression irradiation with the Kromayer Lamp and blue filter.

Technique. Sollux Lamp with localizer, 20-30 minutes at close interval, followed by Kromayer Lamp with blue filter, compression 6-8 minutes (standard Kromayer) to produce bleb over lesion. Repeat on different (adjacent) skin area next day. "This technique allows of the most penetrating and intensive active hyperæmia which is in any way possible" (831). When the lesion is in the stage of strong inflammatory reaction, after 4-5 such doses on 2-3 days, manipulative measures can be successfully applied.

Alpine Sun Lamp. General body baths, 1st degree erythema : Tonic Course.

References: 794 831 845 913

Cancer.

Ultra-violet radiation itself has no effect on the size of existing cancerous tumours, but general resistance plays an important part in enabling the system to combat the invasion. Combined with deep x-ray therapy to the growths, actinotherapy improves the general resistance, restores loss of weight, and frequently enables the patient to return to normal life for prolonged periods.

Technique. Alpine Sun Lamp. General body baths, sub to 1st erythema doses : Tonic Course.

References:

[241] Hernaman-Johnson, F.—*Brit. Med. Jnl.*, November 19th, 1927.
[242] Hernaman-Johnson, F.—*Brit. Jnl. Actinotherapy*, May, 1929.
[243] Hernaman-Johnson, F.—*Brit. Med. Jnl.*, October 5th, 1929.
[244] Worth, E. H.—*Med. Press*, October 1st, 1930.
Also Nos. 792 913

Carbon Monoxide Poisoning.

Coupled with the usual measures (oxygen respiration, cardiac stimulants), actinotherapy accelerates desaturation of the blood and assists the heart's action.

Technique. Alpine Sun Lamp. General body irradiation, 2nd degree erythema dose. Continue with tonic dose during convalescence.

Reference:

[245] Koza, F.—*Med. Klin.*, No. 12, 1930 (Abstract *Brit. Jnl. Actinotherapy*, September, 1930, April, 1931).

Carbuncles *(see Boils)*.

Catarrh, Nasal *(Rhinitis, Coryza)*.

(*See also Ozæna.*)

Local irradiation gives good results. General irradiation is a useful adjuvant in many cases.

Technique. Cleansing, removal of mucus and crusts, is essential before treatment. Spray or paint the nostrils with anæsthetic (20 per cent. cocaine).

Kromayer Lamp. Have the lamp running, with socket disc affixed. Insert nasal applicator (No. 504, 505 or 508) to full extent into the nostril. Then grease nostrils ("Protectol," lanoline) to protect them from aberrant radiation. Bring up the lamp and attach burner to applicator. Irradiate for 2nd degree erythema reaction on entire length of membrane, withdrawing the applicator steadily during the treatment.

Acute Coryza will frequently clear up under luminous heat therapy alone (857).

Sollux Lamp with localizer, applied locally for 20-30 minutes at smallest tolerable distance, protecting the eyes.

Chronic Nasal Catarrh may require protracted treatment. General light baths with the Alpine Sun are a valuable adjuvant in this condition.

References:

[246] Evers, A.—*Med. Klin.* No. 11, 1931.
Also Nos. 178 790 796 857 862 863 879

Chancroid.

Several writers report excellent results from ultra-violet alone. Bubos sometimes subside without incision ; observation should be kept and abscesses evacuated if they persist after two or three irradiations.

Technique. Kromayer Lamp with applicator, massive doses (4th degree reaction) on ulcer surface only ; then a local 3rd degree erythema dose on surrounding skin. After infection is killed, give milder local stimulus doses daily until healing is established. Most cases are cleared up in two weeks ; chronic cases may require much longer.

References:

[247] Tomasone, U.—*Riforma Medica*, 1925, No. 14.
[248] Soukhareff, V.—*Brit. Med. Jnl.*, January 5th, 1929.

Also Nos. 621 786 790 827 881

Chilblains.

For dealing with the local lesions, the results from actinotherapy are surprisingly good. The worse the condition the more striking the results (793). There is usually an underlying systemic condition, for which general actinotherapy combined with calcium lactate is valuable (or with thyroid gland and iodine in the fat, phlegmatic type of female patient) (249). Under local irradiation the irritation is rapidly calmed and the fingers or toes resume their normal appearance. The severe itching subsides at the first or second irradiation ; results are lasting.

Technique. Alpine Sun or Kromayer Lamp, local irradiation on lesion, 2nd degree erythema ; repeat on subsidence. 3-6 treatments are usually sufficient. Combine with Alpine Sun Lamp general body baths and concomitant calcium therapy as indicated.

References:

[249] Barber, H. W.—*Lancet*, December 4-11th, 1926.
[250] Humphris, F. H.—*Practitioner*, October, 1930.
[251] Jost—*Schweizer Med. Ws.*, 1920, No. 52.

Also Nos. 157 790 792 793 854 885 894

Child Welfare.

The application of actinotherapy in children's diseases is indexed under various sections of this book : Rickets, Tetany, Whooping Cough, etc. Reference is here made to its use in a wider, prophylactic sense. In the words of Dr. H. Stanley Banks (261) :—

> "Of all the uses of ultra-violet light in the field of Public Health, that which seems to me to be easily first in importance in this country is in the prevention and cure of rickets, malnutrition and debility in infants . . . Ultra-violet light can do much to restore their unstable metabolism to one which enables them to grow strong and straight, with good powers of resistance to acute disease."

In a carefully recorded typical series of cases, this writer observed the following effects of light treatment :—

Increase in weight (group 1-2 years old, 10.2 ozs. gain per month—41 per cent. over normal).

Increase in hæmoglobin (average 9 per cent. gain).

Increase in muscular activity (all children over 12 months were enabled to stand or walk).

Improvement in general health (better sleep, better appetite, decrease of nervous irritability—constant crying, etc.—more activity and brightness).

Healing of specific conditions (rickets, bronchitis, enteritis, spasmophilia).

References (selected) :

[252] Gamgee, K. M. L.—The Artificial Light Treatment of Children (10/6), 1927.
[253] Birk, W. & Schall, L.—Die Behandlung der Kinderkrankheiten mit ultra-violett und Röntgenstrahlen (2nd edition), (RM. 12), 1932.
[254] Weltring, B.—*Med. Klinik*, 1924, No. 15.
[255] Sherry, I. S.—*Clinical Med.*, March, 1926 (*Quartz Lamp*, June, 1926).
[256] Churchill, S.—*Med. Officer*, July 17th, 1926.
[257] Sherry, I. L.—*Archives Phys. Therapy*, November, 1926.
[258] Cassie, E.—*Maternity and Child Welfare*, September, 1927.
[259] Cassie, E.—*Lancet*, November 26th, 1927.
[260] Huldschinsky, K.—Lichttherapie in der Kinderheilkunde und prophylaktische Lichtbehandlung (in Handbuch der Lichttherapie, ed. Hausmann & Volk), 1927.
[261] Banks, H. S.—*Brit. Jnl. Actinotherapy*, March, 1928.
[262] Reynolds, N. R.—*Phys. Therapeutics*, May, 1928.
[263] Scott, H. C.—*Actinic Practitioner*, April, 1929.
[264] Wilkins, E. H.—*Med. Officer*, May 4th, 1929.
[265] Cassie, E. & Cox, U.—*Lancet*, April 19th, 1930.
[266] Wilkins, E. H.—*Med. Officer*, January 23rd, 1932.
[267] Perlman, H. N.—*Brit. Jnl. Phys. Med.*, February, 1932.

Also Nos. 472 805 807 809 812 812a 813 814a 814b 816 819

Chorea.

Irradiation rapidly mitigates symptoms and relieves insomnia. Results are satisfactory in most cases, e.g., Derby School Clinic (810) report on 19 cases ; all who completed treatment (15 cases) "much improved."

Technique. Alpine Sun Lamp, general irradiation, 1st to 2nd degree erythema. Continue Tonic Course until results are established.

References: 790 810 819

Cœliac Disease.

"Cœliac rickets can be completely cured, even when the patient is on a fat-free dietary, by ultra-violet irradiation" (270). The value of light therapy consists here in increasing calcium-assimilation. It should of course be combined with strict regulation of diet.

Technique. Alpine Sun Lamp, general body baths, 1st degree erythema ; Tonic Course.

References:

[268] Hess, J. H.—*North West Med.*, June, 1926.
[269] Michelmore, R. S.—*Lancet*, December 18th, 1926.
[270] Parsons, L. G.—*Archives. Dis. in Childhood*, August, 1927.
Also No. 589

Colds, Common.

This common infection is readily aborted by a sterilizing dose of ultra-violet rays to both nostrils, the naso-pharynx, and tonsils. In the acute stage, a single treatment usually effects this result within 12 hours.

As a prophylactic measure, it is found that the resistance of cold-susceptible persons is markedly increased by a course of general body baths (273).

Technique. (***Acute Cold***). Kromayer Lamp, with applicator 504 inserted full length into nostril (blue filter). Switch over to white light and slowly withdraw so that 3-4 minutes irradiation has been given to passage. Repeat in other nostril. Change to applicator 507 and irradiate naso-pharynx 2-3 minutes ; then with No. 501, about 1 minute to back of throat. (These approximate times are stated for Standard Kromayer Lamp, and should be increased for the Model II type).

(***Prophylaxis***). Alpine Sun Lamp, preferably combined with Sollux Lamp to guard against chill. General body baths, sub to 1st degree erythema doses, repeated once weekly.

References:

[271] Hill, L. & Clement, M.—"Common Colds" (1929).
[272] Maugham, G. H. & Smiley, D. F.—*Brit. Jnl. Actinotherapy*, May, 1929.
[273] Maugham, G. H. & Smiley, D. F.—*Brit. Jnl. Actinotherapy*, September, 1930.
[274] Webster, J. H. D. & Troup, W. A.—*Brit. Med. Jnl.*, March 5th, 1932 (*Quartz Lamp*, S, April, 1932).
Also Nos. 330 618 879

Colitis.

Whether the condition is due to vagotonia, infection, diverticulosis, or associated with adhesions, actinotherapy gives valuable results. Prescribe suitable diet free from roughage, with sedatives and bismuth or barium medication.

Levy (280) analyses results of treating 600 cases by technique outlined below ; about 70 per cent. of all cases remain free from symptoms, and 90 per cent. of mucous colitis patients.

Technique. Sollux Lamp regional on abdomen, 20-30 minutes, followed by Alpine Sun, general body baths, 1st degree erythema. Continue as stated for tonic course. Repeat the Sollux Lamp treatment at each session until acute inflammatory symptoms subside.

References:

[275] Armani, L.—*Raggi Ultravioletti*, April, 1925.
[276] Hurst, A. F.—*Lancet*, December 4th, 1926.
[277] Levy, L. H.—*Phys. Therapeutics*, February, 1927.
[278] Levy, L. H.—*Phys. Therapeutics*, February, 1928.
[279] Levy, L. H.—*Phys. Therapeutics*, February, 1929.
[280] Levy, L. H.—*Phys. Therapeutics*, May, 1929.
[281] Torrelli, G.—*Raggi Ultravioletti*, March-April, 1930.
Also No. 793

Conjunctivitis, Acute.

Acute forms, after removal of all immediate causes, respond quickly to luminous heat treatment.

Technique. Sollux Lamp, short and frequent sessions (10-20 minutes) two to three times each day, on closed eyelids. In specific types (gonococcal, etc.) apply luminous heat as adjuvant to medicinal procedures. (*See Gonorrhoeal ophthalmia*).

References: 502 504

Conjunctivitis, Chronic.

Technique. Kromayer Lamp with applicator, to produce 3rd degree erythema on conjunctiva ; use everting forceps if necessary. The cornea should be protected from the rays.

General tonic baths with the Alpine Sun may be combined with advantage.

References: 504 506 513

Convalescence (*see Debility*).

Corneal Ulcers (*see Ophthalmology*).

Coryza (*see Catarrh, Nasal*).

Cystitis.

The main information available is given by Dr. Saidman and his assistants at the Institut d'Actinologie. Using combined luminous heat and ultra-violet irradiation for cases of cystitis after nephrectomy for renal tuberculosis, he states that :—

> "Cystitis is refractory to irradiation. Only about the 6th session is any amelioration of symptoms observed. The pain on micturition first diminishes ; the urine becomes clearer ; frequency is reduced towards normal ; seminal capacity increases ; hematuria becomes less frequent."

Other authorities (Bernay [883], Meschede [884]) have devised special appliances for cystic irradiation, and claim good results.

References: 740 791 883 884

Dacryo-Cystitis (*see Ophthalmology*).

Deafness.

Some cases of deafness, due to various causes, show marked improvement after general light baths. In cases due to lymphadenoid hyperplasia, Denman (283), Hollender (857) and others, advise X-radiation to eliminate lymphoid foci, combined with general ultra-violet to assist recovery.

Technique. Combined with special treatment of underlying causes according to the case-indications, give general irradiation with Alpine Sun Lamp. 1st degree erythema doses, repeated two to three times weekly.

Perforated eardrums. Leicher (286) has effected regeneration of drum tissues in 19 cases, using combined cautery and local ultra-violet. Prognosis depends largely on patient's age ; best results are obtained below 25 years, but success has been achieved at twice that age.

Technique. Close the perforation with cotton wool. Apply the Kromayer Lamp with applicator round margins of drum (5 times trunk erythema dose), to produce vascular suffusion on malleum. 24 hours later, cauterize drum margins with concentrated trichloracetic acid. Repeat irradiation and cautery at 2 to 3 weeks intervals, until regeneration is satisfactory.

References:

282 Lacey, T. B.—*Jnl. Radiology*, October, 1924.
283 Denman, I. O.—*Clinical Medicine*, February, 1926.
284 Barnet, H. N.—*Jnl. Larynology*, December, 1927.
285 Hunter, T. C.—*Brit. Med. Jnl.*, January 19th, 1929.
286 Leicher, H.—*Zs. für Laryngologie* 1931, 20, No. 4.

Also Nos. 792 857

Debility and Convalescence.

These conditions are "probably the most responsive of all general ailments to ultra-violet light, provided erythema doses are avoided and there is no 'master' ailment inhibiting benefit" (852).

Premature and debilitated infants make excellent progress under actinotherapy, with steady gain in weight (791).

Debility during Convalescence after acute illness shows rapid improvement, provided that due attention is given to diet, rest, and general hygiene.

Recovery from whooping cough has been reduced from 50 to 20 days by actinotherapy (775), and it is recommended as routine treatment for all Isolation Hospital convalescent cases (261).

Convalescence after operation. (*See also* "*Wounds*"). The general tonic effects of actinotherapy are found valuable in post-operative cases. Patients rest better, heal more quickly, gain strength more rapidly, and qualify for earlier discharge.

Used as a routine measure, actinotherapy and other physical treatment have shortened patients' stay in hospital by 3½ days (289).

Technique. Alpine Sun Lamp (or Jesionek Lamp). General body baths ; sub-erythema doses : Sedative Course. If patient is confined to bed at home, this course can be administered with the Portable Lamp.

References:

287 Heald, C. B.—*Lancet*, December 4th, 1926.
288 MacIntyre, E. J.—*Brit. Jnl. Phys. Med.*, August, 1931.
289 Miller, H. C.—*Archives Phys. Therapy*, February, 1932. (*Quartz Lamp*, S, April, 1932).

Also Nos. 252 261 264 265 791 793 796 797 800 808 809
810 814a 817 819 830 852

Dental Surgery.

Actinotherapy has an established place in Dental Surgery. Much can be accomplished by local application as a conservative measure in septic conditions of the mouth and teeth.*

Research work indicates that there is a still greater field for the application of general irradiation as a prophylactic measure to ensure proper development and resistance to caries ; and general light baths are always a most valuable adjuvant to the focal irradiation.

The oral conditions in which actinotherapy has found greatest use are :—

Post-extractive pain.
Bleaching of discoloured teeth.
Dental abscess.
Alveolectomy (after-treatment).
Maxillary Fractures.
Pyorrhoea (q.v.).
Gingivitis (q.v.).
Vincent's Angina (q.v.).

* *Special handbooks on dental conditions are obtainable on request from the Hanovia Co. or its agents.*

Post Operative Pain. (*See also Neuralgia, facial*). This procedure is based on the marked analgesic effects of ultra-violet rays on the nerve endings. The local reaction results in a suffusion of the tissues with lymph and leucocytes, producing a rapid formation of granulation tissue. Bleeding wounds dry up in a few hours, and due to the antiseptic effects of the irradiation, the risks of secondary infection are greatly reduced. Irradiation is a great help to rapid healing of the wound.

Technique. Dry out the wound thoroughly. Use the Kromayer Lamp fitted with applicator 558, applied to socket of extracted tooth in contact for 1st degree reaction (use applicator 552 or 553 if access is difficult). Then same exposure to gums facially (use applicator No. 554) and lingually (applicator No. 555 or 506). Repetition is seldom required.

Reference:

[290] Winter, L.—*Internat. Jnl. Orthodontia*, May, 1932. (*Quartz Lamp*, S, October, 1932).

Bleaching Discoloured Teeth. Rosenthal, Betancourt and other users of this procedure state that time for final result depends on whether the tooth is dead or alive, its original colour, etc. Excellent cosmetic results are obtained in very many cases.

Technique. Open tooth ; clean pulp cavity and canals, and seal. Isolate tooth with rubber dam. Moisten tooth with fresh neutral $H_2 O_2$, and insert peroxide tampon inside. Renew peroxide every few minutes during prolonged irradiation (20-30 minutes each session, using the Kromayer Lamp with suitable applicator). Repeat till result is satisfactory ; it is advisable slightly to overbleach if possible.

References:

[291] Rosenthal, P.—*Le Laboratoire et la Progres Dentaire*, September 2nd, 1910.

[292] Betancourt, J.—*The Dental Surgeon*, March 21st, 1925.

[293] Bischoff, A.—*Schweizerischer monats, f. Zahnheilkunde*, April, 1926.

Dental Abscesses. Folstein (295) (310), whose technique is summarized below, obtains regeneration after about five sessions.

Technique. Take X-ray to establish status of tooth. Procedure is then as follows, visits being at two days intervals : Irradiation is given each time on both facial and lingual aspects of tooth in apical region, using Kromayer Lamp with suitable applicators. First degree reaction, except as otherwise indicated.

1st Visit.	Open tooth and establish drainage of pus. Irradiate.
2nd Visit.	Remove contents of pulp chamber, and seal cavity with mild dressing. Irradiate.
3rd Visit.	Sterilize root canals ; seal with mild dressing. Irradiate.
4th Visit.	Adjust coffer dam, open canals and flush with alcohol. Fill canals with chloro-resin solution (50/50) followed by gutta-percha inserted in the form of small needles. Seal cavity. Irradiate with compression for 3rd degree reaction.
5th Visit.	X-ray to check regeneration. If incomplete continue successive irradiations (2nd degree reactions) until final result.

Where a fistula exists, continue irradiation after sealing root canals ; 2 to 3 treatments, until it heals.

References:

[294] Bovie, W. T.—*The Quartz Lamp*, April 15th, 1925.

[295] Folstein, I. L.—*The Dental Cosmos*, November, 1925.

Alveolectomy (use after). *Technique.* Retract the gum tissue-flap ; protect tissue with gauze or cotton, and give a 3rd degree reaction on the exposed bone over each extraction, placing the applicator on a level with the root of the tooth. If the incised gum is to be sutured, this should be done first and a second degree reaction given over that area. If the frenum has been incised, it should be sutured before irradiation.

Maxillary Fractures. "The treatment of fractures of the superior and inferior maxillae presents difficulties not found in fractures of any other bones of the body. The necessity for the restoration of perfect occlusion and the position of the oral cavity as the portal of the alimentary tract furnish complications which necessitate rapid and accurate therapeutic measures. The ultra-violet ray, through its inherent properties, is an invaluable adjunct to the recognized methods of treatments" (312).

Technique. First dehæmatize the area by local irradiation with the Sollux Lamp, using localizer and blue filter for 30 minutes minimum.

Irradiate with the Kromayer Lamp in contact with tissue directly above line of fracture ; 1st-2nd degree reaction. Repeat daily.

References on Dental Surgery (selected):

296 Lippmann, L. B.—*Amer. Jnl. Electrotherapeutics*, October, 1921.
297 Bode, A.—*Zahntechnische Reform*, January 13th, 1925.
298 Lake, F. W.—*Dental Cosmos*, February, 1925.
299 Rowlett, A. E. & Spain, I. S.—*Brit. Dental Jnl.*, August 15th, 1925.
300 Talbot, F.—*Brit. Dental Jnl.*, November 16th, 1925.
301 Read, C.—*Brit. Dental Jnl.*, August 2nd, 1926.
302 Rowlett, A. E.—*Brit. Jnl. Actinotherapy*, June, 1926.
303 Evans, W. H., Riding, D. & Glynn, E. E.—*Lancet*, September 17th, 1927.
304 Hall, P.—*Brit. Dental Jnl.*, April 15th, 1927.
305 Kieffer, J.—*Dental Mag.*, June, 1927.
306 Lake, F. W.—*Archives Phys. Therapy*, May, 1927.
307 Miller, N.—*Brit. Jnl. Actinotherapy*, January, 1927.
308 Rowlett, A. E.—*Dental Surgeon*, October 8th, 1927.
309 Bramer, M. L.—*Jnl. Amer. Dental Assn.*, October, 1928.
310 Folstein, I. L.—*Amer. Jnl. Phys. Therapy*, August, 1928.
311 Talbot, F.—Actinotherapy for Dental Diseases (5/-). 1928.
312 Winter, L. & Hayes, L. V.—*Dental Cosmos*, November, 1928.
313 Hlavac, C. W.—*Amer. Dental Surgeon*, April, 1929. (*Quartz Lamp*, June. 1929).

314 Murphy, J. F. X.—*Internat. Jnl. Orthodontia*, July, 1929.
315 Reade, R. J.—*Canadian Dental Research Foundation*, 1929, Bulletin No. 13.
316 Dufestel, L. G. & Chambenoit, R.—Les Applications locales des rayons Ultra-violets : Odonto-Stomatologie (18 frcs.) 1930.
317 Folstein, I. L.—*Amer. Jnl. Phys. Therapy*, August, 1930.
318 Rasmussen, A. T.—*Archives Phys. Therapy*, May, 1930.
319 Furniss, A.—*Med. Officer*, January 10th, 1931.
320 Furniss, A.—Ultra-violet Therapy (12/6), 1931.
321 Holman, C. B.—*Brit. Jnl. Phys. Med.*, June, 1931.
322 Nivard, E.—*8th International Dental Congress*, Paris, 1931.
323 Sampe, A. A.—*Dental Survey*, November, 1931 (*Quartz Lamp*, S., April, 1932).
324 Talbot, F.—*Brit. Dental Jnl.*, February 2nd, 1931.

(See also Special References Nos. 567-572 767)

Dermatitis.

Whether a dermatitis be due to infection (staphylococcus, seborrhoea, etc.) or to an irritant (fur, dyes, vegetation, etc.) some supersensitiveness of the skin is probably a causal factor. Combined with avoidance of further irritation, and due alleviatives for the irritation (salicylic alcohol 1 per cent., etc.), actinotherapy is valuable for re-establishing a healthy skin condition.

Technique. During "weeping" stage, Sollux Lamp, at tolerable distance, with red filter for drying effect, as advised under "Eczema."

When lesions are dry, Alpine Sun Lamp, sub-erythema doses (distance 40 inches). Increase cautiously if obvious improvement results.

(For Rœntgen dermatitis, see "X-Ray Burns.")

References:

325 Dowling, G. B.—(Staphylococcal eruptions), *Jnl. Clin. Research*, April, 1926.
326 Ullmann, K.—(Fur dermatitis), *Ars Medici*, April, 1926.
327 Goldstein, M.—Dermatitis venenata due to chrysanthemum leaves, *Jnl. A.M.A.*, May, 16th, 1931.

Also Nos. 855 901

Dermatomycoses.

Powerful local sterilizing doses of ultra-violet rays give good results in fungus infections of the skin.

Technique is as detailed under "Tinea (treatment)." Other forms mentioned in available reports include Saccharomycosis (^{329}), Actinomycosis (^{914}), and Favus (^{328}). In the last condition Dr. Cipriani used the Sollux Lamp for deeper penetration.

In many of these conditions, the characteristic fluorescence of the fungus is a useful aid to diagnosis (see pages 23, 142).

References:

328 Cipriani, M.—*Raggi Ultravioletti*, January, 1929.

Also Nos. 329 651 652 914

Diabetes.

Good results are obtained in cases of glycosuria. Irradiation stimulates pancreatic activity and insulin formation. In some cases glucose will disappear under irradiation ; where insulin is being administered, the dose can often be reduced. A patient of Nicory's (^{854}), after 48 irradiations, reduced insulin intake from 245 to 174 units, was able to resume exercise, and gained 9 lbs. in weight.

Rothmann (^{329}) and others report good results in associated skin disorders, diabetic xanthoma, pruritis, furunculosis, and intertriginous mycosis.

Caution. High insulin-intake may sensitize the subject (see page 41). Erythema-reaction should be determined before giving the first irradiation.

Technique. Alpine Sun Lamp. General body baths, 1st degree erythema doses. Continue as Tonic Course, keeping check of sugar in the urine.

References:

329 Rothmann, S.—Strahlentherapie, 1927, 24, p. 465.

Also Nos. 114 152a (discussion) 791 797 848 854

Diphtheria Carriers.

Local actinotherapy administered to the tonsils and naso-pharynx sterilizes diphtheria carriers. 50 per cent. of cases are sterilized at the first irradiation ; in a test series none were swab-positive after three treatments.

The valuable effects of general actinotherapy for diphtheria convalescents should also be remembered (see "Debility").

Technique. Kromayer Lamp, with applicator No. 510, contact on tonsils, giving powerful reaction. Treat one tonsil at each session.

Kromayer Lamp with applicator No. 508 in nose, after contracting the mucous membrane (adrenalin chloride solution). Insert applicator to full length before attaching lamp. Ten minutes application in each nostril, slowly withdrawing the rod during treatment.

References:

330 Donnelly, L. C.—*Jnl. Mich. State. Med. Soc.*, September, 1921.
331 Langenfelter, G. P.—*Colorado Med.*, March, 1928. (*Quartz Lamp*, May, 1928).
332 Petit, O. A.—*Brit. Jnl. Actinotherapy*, September, 1929.
333 Hervé, F.—*Jnl. de Med. Bordeaux*, May 20th, 1930.

Duodenal Ulcers (*see Gastric Ulcers*).

Dysmenorrhoea (*see under Amenorrhoea*).

Dysmenorrhoea, Membranous.

Küstner (^{334}) describes this condition as due to lack of the trypsin ferments necessary in elimination of the uterine membrane. Experiments having indicated that red light gave the required hormone stimulus, he applied these in a series of cases, with outstanding success.

Technique. Sollux Lamp with red filter. First exposure, local over abdomen, 1 hour at 20 inches distance ; repeat daily.

After about 15 exposures, every 2nd day; after 30 exposures, 1-2 times weekly.

References:

[334] Küstner, H.—*Zentralbl. f. Gynak.*, September 24th, 1932.

Eclampsia.

The value of actinotherapy in reducing abnormal *blood pressure* (q.v.) has led to its effective use in pre-eclamptic states. Mayer's 25 cases (all primaparæ) showed reductions of blood pressure from 160 to 110 mm., disappearance of headache, œdema and albumen; convulsions were averted and spontaneous delivery obtained after irradiation 2-3 times weekly.

Technique. Alpine Sun Lamp. General body baths, 2nd degree erythema doses on half the body area. Take observation of blood pressure and albumen in urine. Repeat irradiation (on other half body area) in 2-3 days.

References:

[335] Hochenbichler, A.—*Monatss. f. Geburtshilfe*, 1922, 62, p. 269.
[336] Mayer, A.—*Wiener Klin. Ws.*, 1926, No. 52. Abs. *Brit. Jnl. Actinotherapy*, October, 1927.
[337] Hochenbichler, A.—*Med. Press*, April 25th, 1928.

Eczema.

Actinotherapy is a valuable adjuvant in healing all forms of eczema. Being usually due to underlying metabolic disorders, the condition calls for general irradiation applied for systemic reactions. The diverse skin manifestations necessitate a very varied technique of irradiation which must be suited to each case, combined with other therapeutic measures, following the lines indicated.

Acute Weeping Eczema (*eczema rubrum*). Erythema will exacerbate the condition. Irradiation with Alpine Sun Lamp, minimal doses (e.g., 1 minute at 40 inches) followed by 2 per cent. boric lotion or 1 per cent. resorcin fomentations. Thedering (795) and other authorities advise Sollux Lamp with red filter, applied from a distance of 30 to 40 inches, to dry the acute weeping surfaces thoroughly before ultra-violet treatment is commenced.

Sub-Acute Eczema. Alpine Sun Lamp. General body baths, sub-erythema doses (e.g., 2 minutes at 40 inches). If the condition has reached a chronic stage it may be necessary to stir it to an acute stage by one 2nd degree erythema dose, followed by mild irradiations (Sedative Course).

Pustular Eczema. Alpine Sun Lamp. General body baths. 1st degree erythema dose, repeated once weekly.

Squamous Eczema, with crusting. All crusts must be removed (e.g., $H_2 O_2$) before irradiation. Then Alpine Sun Lamp, 2nd degree erythema dose. If this produces a weeping reaction, alleviate as indicated above, and repeat after 4-5 days interval with the same or smaller dose. When reaction is moderate, continue on lines of Intensive Course.

Hyperkeratotic Eczema : Chronic indurated Eczema. Here the aim of light therapy is to produce desquamation of the stratum corneum. The Alpine Sun Lamp is applied to the affected areas with a 3rd degree erythema dose; obdurate cases may require contact irradiation with the Kromayer Lamp and blue filter. Repeat on subsidence and increase according to previous reaction. Three or four such applications should be sufficient.

Special Technique. Huldschinsky (340) has obtained excellent results by wetting the eczema surfaces with 5 per cent. silver nitrate solution and irradiating locally until the solution blackens. Repeat every 1-2 days until healed.

References:

[338] Mosse, K.—*Deuts. Med. Ws.*, 1924, No. 51.
[339] Falkner, H. G.—*Actinic Practitioner*, February, 1929.

[340] Huldschinsky, K.—*Brit. Jnl. Actinotherapy*, February, 1929.
[341] Kirschmann, K.—*Deuts. Med. Ws.*, July 5th, 1929.
[342] Savill, A.—*Lancet*, April 6th, 1929.
[343] Savill, A.—*Brit. Jnl. Actinotherapy*, December, 1930.
[344] O'Donovan, W. J.—*Lancet*, October 31st, 1931.

Also Nos. 159^{a} 793 795 848 853 885 887 889 891 892 893 896 907

Emphysema, Pulmonary.

Actinic irradiation produces good results on the symptoms, functional disturbance, and general condition.

Technique. Alpine Sun Lamp, locally on chest and back. Second degree erythema, repeated on subsidence (or irradiate chest and thorax at alternate sessions).

References: 724 791

Empyema.

Following antrum or sinus operation, appendictectomy, pneumonia, etc., discharging empyema can be effectually cleared up under actinotherapy.

Technique. Clean opening. Produce hyperæmia by Sollux Lamp (or H.F. effluvation in cavity).

Kromayer Lamp with suitable applicator in cavity to produce moderate reaction (e.g., standard Kromayer, four minutes).

With this, combine a general light bath from the Alpine Sun Lamp, giving 1st to 2nd degree erythema according to patient's general condition.

Repeat every other day until discharge is cleared up.

References:

[345] Bierman, W.—*Phys. Therapeutics*, June, 1928.
[346] McKenzie, T. Clyde & Rowatt, J.—*Brit. Jnl. Actinotherapy*, December, 1929.

Also Nos. 168 296 307

Encephalitis Lethargica.

The few available reports on this condition indicate good results; Jaffé (348) obtained improvement in 35 out of 40 cases. In several instances patients were enabled to resume full occupation.

Technique. Alpine Sun Lamp. General body bath, full 2nd degree erythema, continued as Therapeutic Course (intervals of 3 days). Repeat the course after 30 days break.

Also, Kromayer Lamp with applicators, to nasal and tonsillar mucous membranes, following usual technique.

References:

[347] Fawcitt, R.—*Brit. Med. Jnl.*, March 5th, 1927.
[348] Jaffé, H. N.—*Brit. Med. Jnl.*, December 31st, 1927.

Also No. 442

Epicondylitis (*"Tennis elbow," etc.*)

There are two methods of light treatment in these conditions: (*a*) the palliative (using luminous heat), and (*b*) the regenerative, using actinic rays.

(*a*) Bryce (350) obtained speedy relief from "sickening pain," and a complete clear-up within two months, by luminous heat.

Technique. Sollux Lamp, with localizer, applied as close as tolerable to injury. Irradiate 30 minutes minimum: repeat daily.

(*b*) Frey (349) cured a series of cases by ultra-violet after heat treatment had failed. His patients were enabled to resume the activities which caused their condition (tennis, carpentry, ironing, etc.) without relapse.

Technique. Kromayer Lamp, in contact over the epicondyle, 2nd degree erythema dose. Repeat 3-4 times in all.

References:

[349] Frey, E.—*Wiener med. Ws.*, April 21st, 1928.
[350] Bryce, A.—*Brit. Jnl. Actinotherapy*, June, 1930.

Also No. 168

Epididymitis *(Gonorrheal, Traumatic, Tubercular)* ; Orchitis.

Acute Forms. These necessitate such usual measures as rest in bed, purgation, etc. Light treatment will consist in local luminous heat radiation for its analgesic and decongestive effect.

Technique. Sollux Lamp with localizer, to affected testicles, at least 30 minutes irradiation, which may be repeated as frequently as required until pain and swelling subside.

Chronic Forms. These react favourably to actinic irradiation. Reduction in size is usually observed after 4-6 exposures, but treatment should be continued after parts have become normal, to obviate relapse.

Technique. Alpine Sun Lamp, local irradiation for 3rd degree reaction on all sides of affected scrotum, covering healthy skin. Taparelli (357) gives 10 minutes at 16 inches. Stone (351) uses Kromayer Lamp in contact for 3 minutes.

Repeat twice weekly, increasing dosage ; 12-20 irradiations in all. Keep patient at rest during the acute stages.

References :

351 Stone, C. T.—*Jnl. Phys. Therapy*, April, 1924.
352 Auge, A. & Alpinat, P.—*Amer. Jnl. Phys. Therapy*, September, 1924.
353 Cipriani, M.—*Raggi Ultravioletti*, 1927.
354 Petrucci, A.—*Raggi Ultravioletti*, January, 1927.
355 Cipriani, M.—*Raggi Ultravioletti*, September, 1928.
356 Dal Pino, C.—*Raggi Ultravioletti*, 1928.
357 Taparelli, A.—*Raggi Ultravioletti*, 1928.
358 Cipriani, M.—*Raggi Ultravioletti*, January, 1929.

Also Nos. 168 622 740 785 796 822 880 881

Episcleritis *(see Ophthalmology)*.

Erysipelas.

The effects of actinotherapy in erysipelas are specific. Previously noted by Continental and American Workers, they have been recently re-stated by Dr. J. M. Davidson (369) after recording 52 cases. A critical fall in temperature sets in within 24-48 hours, and the condition clears up quickly. Relapses are rare, and clear up equally readily on subsequent irradiation.

Technique. Kromayer Lamp. Remove any greasy soothing preparation. At 2 inches distance, irradiate the whole of area affected, including 1½ inches of healthy skin at margins, to produce heavy 3rd degree reaction. Protect only the eyeballs in head cases. The Kromayer Lamp is best for small areas.

For larger lesions, use the Alpine Sun Lamp, covering healthy skin almost to margins of area.

One treatment usually suffices, unless part of the area has been under-irradiated. Leave the area uncovered after irradiation.

References :

359 Petenyi.—*Monatsh. f. Kinderheilk.*, 1921, 21, p. 269.
360 Czepa, A.—*Wiener Klin. Ws.*, 1922, No. 25.
361 Brunauer, S.—*Med. Klin.*, 1924, No. 29. (Abstract, *Amer. Jnl. Phys. Therapy*, November, 1924).
362 Becker, J.—*Munch. Med. Ws.*, March 25th, 1927.
363 Becker, J.—*Strahlentherapie*, 1929, 34, p. 205.
364 Böhmer, L.—*Strahlentherapie*, 1930, 35, p. 133. (Abstract, *Quartz Lamp*, S, October, 1931).
365 Brown, R. K.—*Brit. Jnl. Actinotherapy*, September, 1930.
366 Ude, W. H.—*Brit. Jnl. Actinotherapy*, January, 1930.
367 Ude, W. H. & Platou, E. S.—*Jnl. Amer. Med. Asscn.*, July 5th, 1930. (*Quartz Lamp*, August, 1930).
368 Ude, W. H.—*Archives Phys. Therapy*, January, 1931. (*Quartz Lamp*, February, 1931).
369 Davidson, J. M.—*Brit. Med. Jnl.*, May 21st, 1932. (Abstract, *Quartz Lamp*, S, July, 1932).
370 Troup, W. A.—*Brit. Jnl. Phys. Med.*, December, 1932. (Abstract, *Quartz Lamp*, S, January, 1932).

Also Nos. 253 786 790 796 863 885 887

Erysipeloid.

One single intensive irradiation clears up most cases. Certain forms relapse and may require up to 5 to 6 repetitions ; no instances of failure are recorded.

Technique. Alpine Sun Lamp or Kromayer Lamp. Intense irradiation locally on affected area (e.g., Alpine Sun Lamp, 15 minutes at 8 inches). Repeat on second or third day only if necessary.

References :

371 Mühlpfordt, H.—*Münch med. Ws.*, 1924, **20**, 649.
372 Klauder, Richter and Harkins.—*Arch. of Derm. and Syph.*, 1926, **14**, 6.
373 Mühlpfordt, H.—*Derm. Zts.*, 1931, **60**, 445. (Abstract in *Brit. Jnl. Phys. Med.*, August, 1932).
Also No. 846

Erythema Induratum (*Bazin's*).

The results reported refer to cases in the tuberculous type of erythema indure (Bazin), which occurs in young women, usually on the leg. Oliver (374) reports five cases, all successfully treated.

Technique. Kromayer Lamp, applied with firm compression to indurated areas, 4th degree erythema dose. Treat two or three areas at each session. One application to each area is usually effective.

References :

374 Oliver, E. L.—*Archives Derm. and Syph*, November, 1922. (Abstract, *Quartz Lamp*, September, 1924).
Also Nos. 892 898

Fibrositis (*see Rheumatism*).

Fistulæ.

Chronic discharging fistulæ following appendicectomy, empyema, etc., usually do well. A typical case reported by Dr. Punch (837), which had persisted for three years, cleared up within two months under local and general irradiation.

Technique. Alpine Sun Lamp. General body baths, 1st degree erythema, continued as Tonic or Sedative Course according to patient's general condition.

Also Kromayer Lamp, with suitable applicator, to penetrate the fistula deeply. Expose for intense local reaction ; repeat on subsidence until healed. The special sinus technique (page 48) may be used in these cases.

References :

375 Menard & Foubert.—*C. rendus A.d. Sciences*, April 7th, 1924.
376 Bruer, M.—*Amer. Jnl. Phys. Therapy*, April, 1926.
Also Nos. 314 740 753 805 837 895

Fractures.

Light therapy is a useful adjuvant in treatment.

Luminous heat rays dilate the vessels and increase circulation where applied. This indicates local application of the Sollux Lamp to fractures in or about the joints (Colles' fracture, Potts' fracture, etc.) accompanied by swelling.

Actinic rays increase the calcium and phosphate content of the blood serum. During the process of repair, light baths with the Alpine Sun Lamp will accelerate callus formation. Combined calcium administration and ultraviolet therapy is stated to be more effective than either alone.

Cases are reported of spontaneous rachitic fractures (377) cleared up by actinotherapy.

Technique. Alpine Sun Lamp, local around site of fracture. 1st degree erythema, repeated daily or alternate days.

(General light baths for tonic effect according to patient's condition). Concomitant calcium medication.

For fractures accompanied by pain and swelling (particularly swelling of the hand or foot), allow primary inflammatory reaction to subside. When sub-acute or chronic stage is reached, apply Sollux Lamp daily to tolerance. Follow this by irradiation with the Alpine Sun as above, and with other measures (elevation, passive and active movements, massage) to prevent fibrous ankylosis.

References:

377 Ribadeau-Dumas, Debray & Saidman.—*Soc. de Pediatrie*, June 16th, 1925.
378 Ponzio.—*Radiology*, October, 1931. (Abstract, *Quartz Lamp*, September 15th, 1932).

Also Nos. 166 839 841 913

Furunculosis (*see under Boils*).

Gangrene, Cutaneous.

The few available case reports indicate that this condition in cases of senility, arteriosclerosis, diabetes, etc., can be successfully cleared up by actinotherapy.

Technique. Alpine Sun Lamp (1) general body baths, 1st degree erythema, followed by (2) local 3rd degree erythema dose on ulcers, after removing sloughs. Repeat every 2-3 days.

References:

379 Kriser, A.— *Münch med. Ws.*, 1914.
380 Barth, K.—*Münch. med. Ws.*, September 12th, 1924.
381 Bousfield, P.—*Lancet*, May 14th, 1927.

Also Nos. 784 791

Gastric and Duodenal Ulcer.

Actinotherapy is used as an adjuvant in these conditions, in combination with customary dietic measures, administration of HC1, etc.

Technique. For speedy relief of pain, the aim is to produce a deep reaction over the epigastric area. This may be done by the Alpine Sun Lamp alone, but quicker results are obtained by preliminary luminous heat therapy as below :—

Sollux Lamp on chest and abdomen for 10-15 minutes, to produce mild hyperæmia ; followed by Alpine Sun Lamp, locally, 3rd degree erythema on area from nipples to navel.

One or two days later, give the same reaction on the back. Continue until acute symptoms subside, then give Tonic Course of general light baths for constitutional effects.

References:

382 Plank, H. T.—*Amer. Jnl. Electrotherapeutics*, November, 1924. (*Quartz Lamp*, February, 1925).
383 Pope, C.—*Amer. Jnl. Phys. Therapy*, June, 1927.
384 Levy, L. H.—*Phys. Therapeutics*, February, 1928.
385 Plaschkes, S.—*Zts. f.d. ges. Phys. Therapie*, 1930, 38, No. 4.

Also Nos. 786 789 799 828

Gingivitis.

Technique. The teeth should be thoroughly cleaned. Examine for the most infected areas. Using the Kromayer Lamp, with applicator 532 and 555, give a 2nd degree reaction both on the facial and lingual surfaces, on the inter-dental papillæ. Not more than three posterior teeth should be irradiated at one time. An open mouth irradiation for all the teeth should follow. Further technique follows that stated under "Stomatitis."

References: 296 301 303 308

Glossitis.

If the condition is due to sepsis, relief is obtained by combined local and general irradiation.

Technique. Kromayer Lamp with suitable applicator, applied with gentle stroking to affected areas. First exposure, 30 seconds (Standard Kromayer). Repeat every 3 to 4 days, increasing by 10-15 seconds to maximum of 2 minutes.

Also Alpine Sun Lamp, general body baths, to assist local action.

Reference:

[386] Cutner, M.—*Brit. Med. Jnl.*, October 10th, 1931 (*Quartz* Lamp, S, January, 1932).

Goitre and Exophthalmic Goitre.

In early cases benefit frequently follows on the use of actinotherapy. Ultra-violet rays have stimulating effects on the endocrine glands, and also assist in overcoming any underlying toxæmia or sympathetic disturbance. Plotinkow (388) reports 24 cases cured out of 27 treated. Other writers have failed to obtain comparable results, and regard actinotherapy as an adjuvant only. Saidman gives a caution that patients may be hypersensitive, and prescribes minimal doses. Irradiation is a valuable complement to iodine therapy.

If thyroid gland is being administered it should be given in half doses only during irradiation.

Technique. Local irradiation over the thyroid gland area with the Kromayer Lamp or Alpine Sun to produce 3rd degree reaction. Combine with this a general light bath with the Alpine Sun Lamp, sub- or 1st degree erythema dose only.

Repeat the combined light treatment at intervals of 2-3 days.

References:

[387] Langemak.—*Deuts. Zts. f. Chirugie*, 1922, **177**, 343.

[388] Plotinkow, L. M.—(*2nd Russian Congress of Psycho-Neurology*, 1924).

Also Nos. 791 792 796 834

Gonorrhœa (Male).

Acute gonorrhœa in the male is not an indication for local actinotherapy. General body baths with the Alpine Sun and Sollux Lamp combined are valuable to build up resistance to the infection. These should follow the normal lines of the Tonic Course.

In sub-acute and chronic cases, results have been obtained by local combined with general actinotherapy, although ionization or diathermy are stated to be more effective forms of physical therapy.

Technique. After urethral irrigation, introduce urethral rod (No. 571) lubricated with glycerine, not more than 11-12 centimetres. Attach Kromayer Lamp running at full intensity, and irradiate for 1 minute only along the entire urethra (i.e., not more than a few seconds at any point). Repeat on subsidence, and increase dosage according to first reaction.

Alpine Sun Lamp, general body baths, 2nd degree erythema, following Therapeutic Course.

Gonorrhœa (Female).

The female mucosa is less sensitive to ultra-violet rays than the male urethra, and will usually tolerate 30 seconds irradiation with a new Standard Kromayer burner to give 2nd-3rd degree reaction (786). Actinotherapy is valuable in both acute and chronic forms.

Technique. Before irradiation it is desirable to produce hyperæmia of the membranes ; diathermy or luminous heat (Sollux Lamp) should be used.

Introduce quartz speculum of suitable size to smooth out the walls. Irradiate with Kromayer Lamp and suitable applicator (e.g., No. 501) through the quartz walls to the membrane. Give heavy 3rd degree erythema on each gland and duct. (If quartz speculum is not available, use an ordinary metal duckbill fully inserted and fully stretched. Irradiate the end, then withdraw the speculum an inch or two till the treated area folds together; repeat irradiation and withdrawal until the labia are reached).

Give separate irradiation to cervix, using applicator 571 or 508 inserted to the internal os, and giving a 3rd degree reaction throughout its length.

Alpine Sun Lamp, general body baths, 2nd degree erythema continued as Therapeutic Course.

References: 390 394 399 621 622 786 791 794

Gonorrhœal Ophthalmia.

Dr. J. J. P. Armstrong (389) has successfully treated seventy cases by luminous heat. The active hyperæmia which is thus produced opens the channels of drainage, and relieves stasis, whilst the temperature applied locally is over the survival limit for the gonococcus.

Technique. With patient on couch, wash the eyes with boric acid solution until pus is removed. Cover face and forehead with towels, leaving eyes exposed. Then irradiate with large Sollux Lamp bulb vertically over eyes at 16-24 inches distance according to tolerance, for 1 hour. Wipe off pus and tears as they gather. Wash with boric acid and instil a few drops of argyrol. Repeat twice daily.

References:

389 Armstrong, J. J. P.—*Phys. Therapeutics*, April, 1928.
Also No. 165

Gout.

The action of ultra-violet rays in stimulating skin function and mobilizing enzyme accounts for their pronounced benefit in this condition. Light treatment should be used as an adjuvant to the usual diet and medicinal measures.

Book No. 389

Technique. Alpine Sun Lamp, general body baths, commence with sub-erythema doses, but build up dosage until 2nd degree erythema is obtained.

Kromayer Lamp, to affected joints, 2nd to 4th degree reaction depending on condition. Fibrosed and ankylosed joints will demand the heavier reaction (see Arthritis).

References: 168 789 791 797 831

Gynaecological Conditions.

"If you will use these rays in treating your gynaecological cases suffering from acute or chronic infections, giving sufficient time for the rays to act and of sufficient frequency to get a continued effect, you will agree that they are the best single method of treatment you possess. But do not attempt to remove pus *en masse* or a fibroid tumour with them (390)."

The conditions in which actinotherapy is successfully applied include :—

Pelvic inflammation.
Cervicitis and cervical erosions.
Endometritis.
Vaginitis.
Vulvitis.
Metrorrhagia.
Gonorrhoea (q.v.)
Amenorrhoea and Dysmenorrhoea (q.v.)
Eclampsia (q.v.)
Leucorrhoea (q.v.)
Pruritis vulvae (q.v.)

Technique. Best results are obtained from the combination of local (vaginal) irradiation with the Kromayer Lamp, using suitable applicator to reach the affected area, and general irradiation with the Alpine Sun Lamp. Bear in mind that the vaginal membrane normally tolerates a dose about 50 per cent. greater than corresponding skin dose; and that the more inflamed the part is, the larger the dose indicated.

Where the local condition is associated with systemic toxæmia, general light baths are indicated in addition.

These general light baths are a valuable adjuvant in many forms of gynaecological treatment. Intensive pelvic diathermy, for example, will often produce extreme fatigue in a patient; general irradiation is of great value in overcoming this.

Local Treatment (Kromayer Lamp). Use quartz speculum if necessary to smooth out membrane folds. Affix suitable applicator to reach the lesion. Produce 2nd-3rd degree erythema reaction. Repeat on subsidence, and continue according to results.

General Treatment (Alpine Sun Lamp), general irradiation (abdomen and sacrum to be fully exposed), 1st degree erythema. Repeat every second day or twice weekly.

References:

390 Plank, T. H.—*Detroit Surgical and Gynaecological Soc.*, June 19th, 1918.
391 Donnelly, L. C.—*Jnl. Michigan State Med. Soc.*, January, 1922.
392 Willmoth, A. D.—*Med. Herald and Physiotherapist*, November, 1925 (*Quartz Lamp*, November, 1925).
393 Lang, E.—Die Lichttherapie in der Gynäkologie (*Handbuch der Lichttherapie*, ed. Hausmann & Volk), 1927.
394 Flaskamp, W.—*Proc. 2nd International Conf. on Light*, London, 1928.
395 Rocchi & Boschis, O.—*Raggi Ultravioletti*, November, 1928.
396 Willmoth, A. D.—*Phys. Therapeutics*, December, 1928.
397 Franco, C. D.—*Proc. 1st Philippine Tb. Congress*, 1926 (*Quartz Lamp*, April, 1929).
398 Ballico, I.—*Raggi Ultravioletti*, March-April, 1930.
399 Wilson, J.—*Brit. Jnl. Actinotherapy*, January, 1931.
400 The use of ultra-violet therapy in obstetrics and gynaecology (Hanovia Chem. Soc., Bulletin No. 311).

Also Nos. 796 848 914

Hay Fever.

Results are excellent; although the immunity given may last only for one season, patients are enabled to continue occupation and reasonable outdoor activity. The combined therapy outlined utilizes the power of general irradiation to raise and fix the blood-calcium, with local irradiation to reduce hypersensitivity in the affected membranes.

Technique. Alpine Sun. General body baths, sub- to 1st degree erythema dose, continued as Sedative Course. This course should be commenced about a month before the onset of the seasonal attacks. Combine with calcium and thyroid medication to establish normal blood-calcium values.

Kromayer Lamp. Technique will vary according to the patient's condition. If seen before violent hyperæsthesia has set in, the procedure given by Sampson (786), Hollender (857) and others may be followed:—Produce hyperæmia of nasal membranes by local high frequency. Follow with Kromayer Lamp and nasal applicator (No. 504, 505 or 508) inserted full length, and withdraw by stages so as to give 30 seconds exposure every half-inch along the nostril. Repeat both sides.

Remove nasal applicator and attach No. 507. Insert *flat* into mouth past uvula, then turn end upwards to irradiate posterior nares. Give diffused irradiation over entire area, avoiding any local overdose. Remove lamp and applicator, attach No. 510, and give final irradiation to throat and tonsils.

Avoid any blistering, but aim at definite erythema reaction on entire nasal mucosa. Repeat every second day. The number of treatments to ensure immunity may vary from 1 to 14; about 7 constitute an average. The treatment should be repeated every year or two.

If the membrane is hypersensitive, the modified technique used by Cemach (408) may be used. Desensitize with 20 per cent. cocaine, and give mild intra-nasal irradiation as indicated above, using the blue filter and giving at most

2 minutes to each nostril (Standard Kromayer Lamp). In this way, ascertain the dose which will stimulate the membrane without producing increased rhinitis; this dose is then increased cautiously. (Cemach omits the posterior nares irradiation).

References :

401 Hollender, A. R. & Cottle, M.H.—*Eye, Ear, Nose and Throat Monthly*, 1924.
402 Hollender, A. R. & Cottle, M. H.—*Jnl. of Otology, etc.*, August, 1924.
403 Hollender, A. R.—*Amer. Jnl. Clin. Med.*, April, 1924.
404 Davison, H. M.—*Jnl. Med. Assn. Georgia*, January, 1925.
405 Hollender, A. R. & Cottle, M. H.—*Med. Herald*, July, 1925.
406 Myers, J. L.—*Am. Jnl. Electro. and Rad.*, December, 1925.
407 Ramirez, M. A.—*Amer. Jnl. Med. Sc.*, December, 1928.
408 Cemach, A. J.—*Brit. Jnl. Phys. Med.*, June, 1931.
409 Schmidt, P.—*Med. Klinik*, No. 22, May, 1931 (*Quartz Lamp*, S, July, 1932).

Also Nos. 786 796 857 870 873 876 879

Heart Diseases.

(*See also Angina Pectoris : Blood Pressure.*)

Through the action of ultra-violet rays on blood pressure (q.v.) blood composition, diuresis, etc., it has pronounced benefit in Tachycardia, Premature contractions, Rheumatic Endocarditis and functional disturbances.

Contra-indications. Where compensation is deficient, actinotherapy may increase œdema and dyspnœa.

Technique. Correct any deficiencies of nutrition (especially of calcium, sugar, iron) and treat septic foci.

Sollux Lamp, short exposure on entire body for gentle warmth (excessive heating is not advisable). This may be followed by massage towards the heart as stimulant to peripheral circulation. Follow on with Alpine Sun Lamp, general body bath, sub- to 1st degree erythema only; after 3rd treatment increase to 2nd degree erythema. The more corpulent the patient, the heavier should be the erythema reaction. Repeat 2-3 times weekly during 3-6 months, with suitable rest intervals.

References :

410 Schäcker.—*Strahlentherapie*, 12, 1921.
411 Echtman, J.—*Med. Jnl. and Record*, December 1st, 1926.
412 Plate, E.—*Brit. Jnl. Actinotherapy*, July, 1929.
413 Laqueur, A.—*Brit. Jnl. Phys. Med.*, April, 1931.

Also No. 796

Herpes Zoster (*Shingles*).

Much assistance can be given to the patient in all forms of herpes, and relief afforded not only from the severity of the eruption but from the accompanying pains. In fact, if seen early enough, little or no pain is experienced after the first treatment. Vigorous local irradiation (2nd degree erythema doses) not only stop the immediate discomfort but prevent scarring (417).

Post-herpetic neuralgia is not a usual sequel in cases treated by actinotherapy. This painful condition has been successfully treated by luminous heat irradiation (Sollux Lamp), as detailed under Neuralgia.

Technique. If the blebs are very irritable, use the Sollux Lamp, with red filter for its drying effect, before applying ultra-violet rays. Sollux Lamp 15-30 minutes, 20 inches distance.

Alpine Sun, local irradiation on lesion, for heavy 2nd degree erythema. Repeat daily until vesicles disappear.

Or the Kromayer Lamp, in contact, to produce 2nd-3rd degree erythema on all vesicles. Repeat at 1-2 days intervals until irritation disappears.

References:

414 Vajano, D.—*Giornale Italiana delle malattie veneree*, 1924, No. 1.
415 Tarchini.—*Amer. Jnl. Phys. Therapy*, November, 1925.
416 Jackson.—*Urologic and Cutaneous Review*, June, 1926.
417 Weinbren, M.—*Lancet*, October 22nd, 1927.
418 Cipriani, M.—*Raggi Ultravioletti*, November, 1928.
419 Devois, A.—*Revue d'Actinologie*, March, 1931.

Also Nos. 515 793 841 847 885 895 896

Hyperpiesis (*see Blood Pressure*).

Impetigo.

"Three or four applications of ultra-violet light in the course of a week or ten days will usually cure an impetigo contagiosa at any stage" (420). All crusts and discharge should be removed, and a brisk reaction is required, repeated until risk of relapse is past (790). It is not necessary to let the disease take its usual three weeks course ; irradiation will definitely check the infection.

Technique. With the Alpine Sun or Kromayer Lamp produce a local 3rd degree erythema reaction after lesion is cleansed of crusts and discharge. Repeat on subsidence until results are established against relapse.

Continue a course of general body baths with the Alpine Sun Lamp, Sedative Course.

References:

[420] Adamson, H. G.—*Med. Press*, May 25th, 1927.
[421] Ellison, J. B.—*Lancet*, June 25th, 1927.
[422] O'Donovan, W. J.—*Lancet*, February 28th, 1931.
Also Nos. 790 894 896 900 907

Infantile Paralysis (*see Poliomyelitis Anterior*).

Iridocyclitis (*see Ophthalmology*).

Iritis (*see Ophthalmology*).

Keloid.

Successful results are reported from blister doses with the Kromayer Lamp. On account of the extensive thickening of the tissues, the blue filter is useful in this condition, as it ensures deeper penetration.

Technique. Kromayer Lamp, with blue filter, firm compression, 4th degree erythema, repeated after sloughing has occurred.

References:

[423] Sibley, W. K.—*17th Report London Derm. Soc.*, 1928, p. 61.
Also Nos. 793 795 885 888

Keratitis (*see Ophthalmology*).

Leishmann's Sore.

Dr. F. H. Humphris has treated two cases with ultra-violet rays. Other remedies had been ineffective, but improvement was soon manifest. One case had a triangular sore in the groin of 7 inches wide : after 16 weeks treatment the entire surface was healed over except two small holes.

Reference : 793

Leprosy.

Results have been obtained in a few cases only. The value of actinotherapy is proven on leprotic ulcers, but experimental as regards other lesions. Treatment has been given both by Kromayer Lamp in contact, and by the Alpine Sun Lamp, using general body baths.

References:

[424] Cruz, M. C.—*J. Philippine Islands Med. Assn.*, July, 1928.
[425] Dhur-Roy, J. & Rakshit, A.—*Indian Med. Gazette*, April, 1930.

Leucoderma : Vitiligo.

Energetic treatment is essential to ensure restoration of pigment ; results are permanent.

Technique. Kromayer Lamp, window in compression contact, 4th degree erythema. Treat each area three to four times, allowing reaction to subside between treatments, and taking care not to produce over-pigmentation. Sibley (429), Axmann (428) and others report that results are accelerated by dabbing skin with alcohol before irradiation; Louste and Juster (426) use oil of bergamot in the same way.

References:

[426] Louste & Juster.—*Bull. Soc. franc de dermat.*, 1918, 53, 920 (*Quartz Lamp*, August, 1929).
[427] Toomey, N.—*Jnl. Missouri State Med. Asscn.*, December, 1922 (*Quartz Lamp*, October, 1923).
[428] Axmann.—*Münch. med. Ws.*, 1925, No. 45.
[429] Sibley, W. K.—*17th Rep. London Derm. Soc.*, 1928 (p. 25).

Leucorrhœa.

Many cases are reported of irritating discharge cleared up by local actinotherapy. This form of treatment is found particularly valuable when the condition is a symptom of vaginitis.

Technique. After examination, insert quartz speculum and irradiate vaginal walls with Kromayer Lamp and suitable applicator, giving special attention to any eroded areas on cervix or membranes. Produce a moderate reaction (1st degree erythema), allowing 50 per cent. more than skin-reaction time for the lamp and applicator used.

References: 390 397 793 794 825

Lichen Planus : Lichen Tropicus.

The eruptions clear up rapidly under actinotherapy. Vigorous erythema is necessary. Lichen hypertrophicus necessitates prolonged compression irradiation with the Kromayer Lamp. In Bernstein's ([885]) case, repetition during four months effected eradication of the trouble.

Technique. With the Alpine Sun Lamp, irradiate the area affected or whole body, for 2nd degree erythema. Repeat on subsidence ; continue as Therapeutic Course.

References:

[430] Juster & Tchiprout.—*Bull. Soc. franc. Derm.*, 1928, 35, p. 15 (*Quartz Lamp*, July, 1928).

Also Nos. 885 886 892 896

Lumbago.

Acute attacks are relieved by production of deep local hyperæmia with luminous heat rays. Chronic forms benefit from erythema doses of ultra-violet rays over the lumbar region.

Technique. Using Sollux Lamp and localizer (or demarcate the area by clothing, etc.) give a full hyperæmia dose on lumbar region (20-30 minutes at short distance) followed by Alpine Sun Lamp locally on back, 2nd degree erythema. Repeat on subsidence ; continue course till results are established.

References:

[431] Girone, V.—*Raggi Ultravioletti*, 1927.
[432] Hall, P. *et al.*—*Brit. Jnl. Actinotherapy*, September, 1928.

Also Nos. 175 491 831 851 852 856

Lupus Erythematosus.

Satisfactory results are obtained in most cases from actinotherapy provided that general light baths are given chief place in treatment.

Technique. General light baths with the Alpine Sun Lamp, sub- to 1st degree erythema reactions, repeated every second day (Sedative-Tonic Course), combined with local irradiation with Kromayer Lamp (Thedering recommends compression, using blue filter, 5-10 minutes).

Recovery is gradual, and the course must be continued for many weeks or months.

References:

[433] Carter, L. J.—*Canadian Med. Jnl.*, February, 1925 (*Quartz Lamp*, October, 1930).
[434] Rowstron, N. F.—*Brit. Med. Jnl.*, March 10th, 1928.
[435] Montgomery, W. E.—*Phys. Therapeutics*, December, 1930.

Also Nos. 159a 795 889a

Lupus Vulgaris (*see also Tuberculosis verrucosa*).

The best results are obtained by treating lupus as the local manifestation of a general tubercular infection ; both local and general actinotherapy are indicated. At the London Hospital this procedure has increased cure from 60 per cent. to 90 per cent. of cases, and Dr. O'Donovan of this institution states (446) that "Early lupus is always curable." The granular tissue surrounding the nodules is dissolved by repeated irradiation until the nodules lie in new scar tissue and are resorbed under the action of light. Treatment may necessitate many months, and patients should be examined after six months, to guard against relapse.

Technique. Kromayer Lamp with skin lens (or window), firm compression, 4th degree erythema on each focus and ½ in. zone surrounding. Alleviate reaction by cold boracic compresses ; repeat on complete subsidence.

Use same procedure, with suitable applicator, for lesions in mouth, throat and nose.

Both the immediate reactions and final results are greatly improved if local hyperæmia is produced in the diseased tissues before application of the Kromayer Lamp. The Sollux Lamp with localizer will give valuable help in this regard.

If lesions are heavily fibrosed through previous maltreatment, softening measures (e.g., luminous heat, electrodessication, creosote + salicylic acid plaster) may be necessary before the erythema reaction can be obtained. Some authorities advise X-rays for this purpose ; others regard them as likely to cause carcinoma later.

Alpine Sun Lamp (combined with Sollux Lamp). General body baths, 1st degree erythema, repeated on subsidence. (Note.—Lupus patients may require about 50 per cent. over normal exposures.)

References:

436 Sibley, W. K.—*13th Rep. London Derm. Soc.*, 1924.
437 O'Donovan, W. J.—*Brit. Jnl. Tuberculosis*, October, 1927.
438 Sequeira, J. H. & O'Donovan, W. J.—*Lancet*, November 26th, 1927.
439 Jadassohn, W.—*Klin. Ws.*, September 30th, 1928 (and *Brit. Jnl. Actinotherapy*, March, 1929).
440 Reyn, A.—*1er Conf. Int. Lumiere, Lausanne*, 1928.
441 Hallam, R.—*Brit. Med. Jnl.*, November 16th, 1929.
442 Hunt, E.—*Brit. Jnl. Actinotherapy*, May, 1929.
443 Sibley, W. K.—*Brit. Jnl. Actinotherapy*, November, 1929.
444 Wilson, J.—*Brit. Jnl. Bio-physics*, October, 1929.
445 Frieboes, W.—*Strahlentherapie*, 1930, 35.
446 O'Donovan, W. J.—*Brit. Jnl. Actinotherapy*, May, 1930.
447 Volk, R.—*Brit. Jnl. Actinotherapy*, October, 1930.
448 Beatty, J.—*Practitioner*, March, 1932.
449 Volk, R.—*Brit. Jnl. Phys. Med.*, June, 1932 (*Quartz Lamp*, S, July, 1932).

Also Nos. 159a 438 668 672 673 676 677 680 688 743 795
804 820 838 886 894 896 897 900 903 905

Mastitis.

The few reports available indicate that actinotherapy has great possibilities in this condition. Even after gangrene and infiltration has set in, irradiation effects improvement within 24 hours, and 4 to 6 treatments suffice to save the breast and enable lactation to be resumed.

Technique. Alpine Sun Lamp, 1st degree erythema on affected breast, repeated daily.

References:

450 Tauber, J.—*Med. Klin.*, May 8th, 1924.
451 Küstner, H.—*Munchener Med. Ws.*, January, 1930 (Abs. *Brit. Jnl. Actinotherapy*, March, 1930).

Mastoiditis.

Acute mastoiditis, if uncomplicated, responds to luminous heat irradiation. If no improvement is noted with 5 or 6 days, it must be assured that complications exist, and surgery is indicated. Dr. Cemach distinguishes two groups as indications :—

(1) "Incipient cases without fever, usually between the third and fifth week of a suppurative otitis, characterized by moderate discomfort, unilateral headache, slight but increasing pain. Moderate pain on pressure, contour of the mastoid process slightly indistinct. All cases in this group react promptly to Sollux Lamp radiation and are rapidly cured. The results of radiation in such cases far outstrip those from all other known conservative means."

(2) "Cases with more pronounced discomfort, local change, and increased temperature. All cases in this group have been cured without relapse. . . . Seventeen cases were treated, six for a month, eight for three weeks, and three for two weeks. Acute mastoiditis is the outstanding indication and its cure the greatest achievement of the Sollux Lamp."

Technique. It is essential to establish and maintain drainage.

Sollux Lamp, with localizer, distance about 4 inches, applied for 30 minutes minimum. Repeat daily or twice daily.

Post-operative cases. Where a sluggish, non-healing infected wound remains after the mastoid operation, local irradiation of the cavity, using the Kromayer Lamp and penetrating applicator, combined with irradiation of infected cervical glands and with a tonic course of general body baths with the Alpine Sun, will effect freedom from pain, decrease of toxicity, and early improvement in the patient's local and general condition.

References:

[452] Cemach, A. J.—*Monatschr f. Ohrenheilk*, 1922, Nos. 8-9.
[453] Doyle, G. F.—*Kentucky Med. Jnl.*, December, 1924 (*Quartz Lamp*, July, 1925).
[454] Vicenzini, B.—*Raggi Ultravioletti*, 1927.

Maternity.

A course of actinic irradiation is highly beneficial throughout pregnancy and lactation. Extensive observations have been made at the Public Health Clinics of Cardiff (460), Bermondsey (806), and many other places. Vomiting is cured in nearly all cases ; tone is increased, and nervous excitability reduced. In the words of Dr. L. C. Donnelly (832) :—"Pregnant mothers are impressed with the fact that ultra-violet treatments insure that their babe will be born with the proper development, and that they will go through pregnancy without loss of teeth, that their kidneys, thyroid and glands of internal secretions will function properly and that they will not develop high blood pressure and convulsions, that their musculature, including heart and uterus, will be developed, so that they will be in physical condition to have sufficient muscular power to give birth to their baby (the tone of their abdominal muscles will be such that they do not develop a large abdomen following child birth) ; the coagulation time of their blood will approach normal so they do not need to fear hemorrhage, and their resistance to infection will be so raised that there is little danger of infection. They are told that if there is an ultra-violet light deficiency that they will themselves suffer by having the calcium and phosphorus withdrawn from their blood in order to nourish the child. This is shown in the mother by increased tendency to tooth decay, breaking down the arches of her feet, tendency to fractures, etc. If there is a marked ultra-violet light deficiency the child will be malformed ; great deficiency could produce a monster. If the mother has plenty of ultra-violet light the child starts life with a stored up amount of the products of light and is able to better resist disease. The mother who has had plenty of ultra-violet light will have an abundance of health nourishing milk and will have no trouble nursing her child. Any mother who does have trouble nursing her child will have much less or no trouble if both mother and child receive ultra-violet."

Technique. General irradiation with the Alpine Sun (or Jesionek) Lamp, following the lines of the Tonic Course (page 36).

References:

[455] Gamgee, K.—*Jnl. R. Sanitary Inst.*, April, 1926.

456 Brown, R. K.—*Med. Times*, June, 1928.
457 Deck, E. J.—*Nursing Mirror*, 20th October, 1928.
458 Holman, H. D.—*Brit. Jnl. Actinotherapy*, February, 1930.
459 Warnshuis, G. J.—*Clinical Med. & Surgery*, May, 1931 (*Quartz Lamp*, July, 1931).
460 Gibbs, N. K.—*Ann. Rept. M.O.H.*, *Cardiff*, 1931 (*Quartz Lamp*, S, January, 1933).

Also Nos. 394 400 806 814 818 820

Lactation. Observations made on a series of nursing mothers who were able to maintain attendance at the Manchester Municipal Clinic (461) showed that "all were successful in improving or maintaining milk-supply for prolonged periods." Similar observations have been made elsewhere. Irradiation of the mother also increases the anti-rachitic properties of her milk (462).

Technique. General light baths with the Alpine Sun Lamp, following lines of Tonic Course (page 36), or alternatively local irradiation with Alpine Sun Lamp on breasts (protecting nipples), 2nd-3rd degree erythema (e.g., 5 minutes at 32 inches distance), repeated daily or every other day.

References:

461 Chisholm, C. & McKillop, M.—*Lancet*, July 30th, 1927.
462 Hess, A. F., Weinstock, M. & Sherman.—*Jnl. A.M.A.*, January 1st, 1927.
463 Smith, N.—*Med. Officer*, November 3rd, 1928.
464 Stolte, K., Wiener, C.—*Deutsche med. Ws.*, February 17th, 1928 (*Brit. Jnl. Actinotherapy*, July, 1928).
465 Vogt, E.—*Deutsche med. Ws.*, August 17th, 1928 (*Quartz Lamp*, June, 1929).
466 Bunbury, D. E.—*Brit. Jnl. Actinotherapy*, November, 1929.
467 Wachtel, M.—*Zentralbl. f. Gynäkologie*, 1929, No. 16.

Mental Diseases.

The use of actinotherapy in mental treatment was debated at the Royal Society of Medicine in 1929 (470) by officers of mental hospitals which administer this form of treatment. Apart from marked increases in weight, appetite, activity and cheerfulness, it is found that with delusional cases, mild types of melancholia, and manic-depressive types, there is considerable benefit in the mental condition.

Dr. Sugden (472) points to the improvement of the dull and backward child, "transformed into a robust, well-nourished and perfectly healthy little animal within a few weeks."

Some cases of confusional insanity, dementia praecox and anergic stupor also yield good results. In Dr. Cormac's words, "Actinotherapy is a very necessary adjunct to the treatment of mental cases. It is employed as a routine for convalescent cases, whose recovery is thereby hastened."

Technique. Alpine Sun (or Jesionek) Lamp, general body baths. Degree of erythema and frequency of repetition must be suited to the circumstances of the case and the underlying condition. Concomitant therapy not to be omitted.

References:

468 Gauvain, H. & McCrae, C. R.—Maternity & Child Welfare, July, 1925.
469 Jackson, J. D. & Chamberlain, L. R.—*Med. Jnl. & Record*, December 19th, 1928 (*Quartz Lamp*, January, 1929).
470 Cormac, H. D. *et al.*—*Proc. R. Soc. Med.*, February, 1929.
471 "Lunacy & Mental Deficiency," 16th Annual Report of the Board of Control, 1929. Part II (*Several reports on light therapy*).
472 Sugden, F.—*Brit. Med. Jnl.*, November 29th, 1930.
473 *Rep. Med. Supt. County Mental Hospital, Whittingham*, March, 1931 (*Quartz Lamp*, S, April, 1932).

Also No. 844

Migraine.

Excellent results are obtained from actinotherapy by combined luminous heat and ultra-violet radiation. The attacks decrease in intensity and frequency, and finally cease. Relapse may occur after some months ; repetition of the course is then again effective.

Technique. Alpine Sun and Sollux Lamps in combination, general body baths, 2nd degree erythema. Repeat on lines of Therapeutic Course.

Reference:

[474] Freund, L.—*Wiener Klin. Ws.*, 1923, No. 42.

Myalgia (*see Rheumatism*).

Myositis.

"There are few therapeutic measures which will yield such brilliant, dramatic results as those which physical therapy will yield when applied to inflammatory conditions of this nature" (476).

Technique. Examine for causal focus and treat.

Sollux Lamp to affected area, applied for at least 30 minutes, close as can be tolerated.

Combine with static wave electrical treatment.

References:

[475] Taparelli, A.—*Raggi Ultravioletti*, March, 1926.
[476] Bierman, W.—*Phys. Therapeutics*, May, 1929.

Naevus, Vascular (*Port-wine mark*).

Intensive actinotherapy will clear up many of these birthmarks, and largely benefit even the more resistant types which do not fade under pressure. Successful results are reported in cases up to 40 years of age.

Technique. Kromayer Lamp with lens in firm contact on skin of naevus to produce very heavy reaction (e.g., Standard Kromayer 5-20 minutes) on the entire affected area. (Clark uses blue filter and 40-minute exposures). Two to four repetitions may be required, at intervals of 3-4 weeks.

References:

[477] Clark, W. L.—*Therapeutic Gazette*, May 15th, 1916.

Also Nos. 159a 263 793 795 885 888 890 896 898 899 906

Neuralgia, Facial.

"Patients with trigeminus neuralgia have been relieved of all pain after the fifth treatment and to date there has been no return" (305).

Technique. Sollux Lamp with localizer to affected area. Distance : shortest tolerable ; time 10-20 minutes according to tolerance. Increase progressively to 30 minutes ; daily irradiation.

Alpine Sun Lamp, general body baths, 1st degree erythema ; continue as Tonic Course.

In cases of tic douloureux, the general body bath should be supplemented by local irradiation (Alpine Sun) on the affected area, 2nd degree erythema dose. Supplement this by intra-oral irradiation with Kromayer Lamp, using applicator 555, along superior and inferior arches of affected side, close as possible to apices of teeth, for 1-4 minutes.

References:

[478] Lichnitzki, V.—*Paris Med.*, December 20th, 1924.
[479] Kirschmann, K.—*Fortschritte d. Med.*, 30th June, 1927.
[480] Vicenzini, B.—*Raggi Ultravioletti*, 1927.
[481] Talbot, F.—*Med. World*, July 29th, 1932 (*Quartz Lamp*, S, October, 1932).

Also Nos. 305 308 312 314 793 796 842

Neuritis and Sciatica.

Rational application of actinotherapy frequently gives brilliant results in these disabling conditions. The acute pain can be relieved by luminous heat as a palliative measure ; more permanent results are assured by the production of severe erythema reactions along the course of the affected nerve and at any points which are tender to pressure. Obviously underlying causes such as septic foci or autogenous toxins must also be treated.

Technique. Sollux Lamp, locally to affected nerve, shortest tolerable distance, 20-30 minutes to produce deep hyperaemia. Followed by:

Kromayer Lamp, contact irradiation at a series of points over the nerve roots and along the nerve course ; 3rd degree erythema at each point. For deep penetration, use the blue filter with four-fold exposure.

Alpine Sun Lamp, general body baths, sub-erythema doses, continue as Sedative Course.

Alternative Technique. Lepsky, Weiss and others have treated many cases successfully on the following lines :—

Alpine Sun, local 3rd degree erythema dose on two areas each 4 inches square, (*a*) lumbar region ; (*b*) back of affected thigh from lower buttock downward. Repeat (on subsidence) on fresh area, centre of thigh, next on lower third, and down leg if pain still continues.

References:

482 Kliatschkin, G. A., *Kazan Med. Jnl.*, October 7th, 1924.
483 Hall, P.—*Brit. Jnl. Actinotherapy*, September, 1926.
484 Kowarshik, H.—*Wiener Klin. Ws.*, 1926, No. 10.
485 Weinbren, M.—*Lancet*, July 24th, 1926.
486 Hall, P.—*Brit. Med. Jnl.*, June 18th, 1927.
487 Harris, W.—*Lancet*, November 5th, 1927.
488 Marchesini.—*Raggi Ultravioletti*, November, 1928.
489 Weiss, R. F.—*Med. Klinik*, 1929, No. 15 (Abstr. *Brit. Jnl. Actinotherapy*, January, 1930).
490 Lepsky, J.—*Ann. Inst. Actinologie*, May, 1931 (*Quartz Lamp*, S, January, 1932).
491 Lepsky, S.—Ultra-violett Behandlung der Ischias (Mk. 1,60). 1932. (Extract *Quartz Lamp*, S, October, 1932).

Also Nos. 167 478 581 719 786 790 793 797 826 831 839 848 856

Nystagmus.

Recent reports indicate that cases of Miners' Nystagmus which come under treatment early respond very well to actinotherapy. Concomitant measures should be applied to the neurosis (iron, strychnine), to septic foci, errors in diet and habits rectified, etc.

Technique. Alpine Sun Lamp, general body baths, 2nd degree erythema on half body area, repeated three times weekly.

References:

492 O'Sullivan, F.—*Practitioner*, January, 1932 (*Quartz Lamp*, S, July, 1932).
493 O'Sullivan, F.—*Brit. Jnl. Phys. Med.*, May, 1932.

Obesity.

Dr. A. Lorand (789), discussing the various types of obesity, states that "in addition to the prescribed diet and the administration of the glandular extracts, the simultaneous use of the Quartz Light will give the very best results with considerable loss of the body weight.

Technique. Alpine Sun, general body baths, more intense on fattest portions (abdomen, breasts, hips, etc.). Follow procedure as Therapeutic Course (page 37).

References:

494 Williamson, C. L. & Broomhead, C. H., *Lancet*, February 4th, 1928.

Also Nos. 789 793

Ophthalmology.

In the eye the diseases most amenable to treatment are chronic inflammations, for which little can be done by ordinary means of treatment. The best time to start treatment is immediately the acute stages have passed, and before the lesion is complicated by accumulation of massive deposits and restoration rendered impossible.

Light treatment is given in the form of general irradiation only, sometimes with local actinotherapy in combination. In the acute inflammatory forms of these diseases luminous heat treatment with the Sollux Lamp gives valuable assistance.

Indications for general irradiation alone:—

Ocular Tuberculosis, including :—

Iridocyclitis Keratitis Dacryo-cystitis	Cases, with few exceptions, improve from the commencement, often with remarkable rapidity.

Phlyctenular Keratitis and Kerato-Conjunctivitis.

After a few days most of the symptoms usually disappear, and a few weeks' treatment secures lasting improvement. The course of treatment should be repeated as a prophylactic against relapse.

Infective Iridocyclitis **Choroiditis** **Iritis** **Scleritis**	General effects good ; as regards the eye itself results are satisfactory in about 50 per cent. of cases. Repeated courses of treatment may be necessary.

Technique. Alpine Sun Lamp, general body baths, sub-erythema doses, repeated three times weekly.

In acute forms apply the Sollux Lamp with red filter, localizer attached, on closed eyelids, 8 inches distance for 20 minutes. Repeat daily, increasing dosage to maximum of 60 minutes at 4 inches.

Indications for combined local and general irradiation :—

Chronic blepharitis.
Chronic conjunctivitis.
Trachoma.
Vernal catarrh.
Acne.
Episcleritis.

Technique. Kromayer Lamp, with applicator (e.g., No. 501) in contact on the everted inner corneal surface. Produce a heavy reaction and desquamation on the entire affected area. Take a fine tip applicator (e.g., No. 552) to irradiate the conjunctival fornices. Repeat on subsidence of reaction, and continue course till results are established.

Alpine Sun Lamp, general body baths, 1st degree erythema. Continue as Tonic Course.

Corneal Ulcers.

Technique. Kromayer Lamp with suitable applicator (e.g., No. 502 or 503) directed at ulcer from 3 mm. distance, without allowing the rays to fall on the pupil (contract this with eserine if necessary). Exposure 45 to 60 seconds (Standard Kromayer), avoiding a severe reaction. Three applications on successive days are usually sufficient (Denman[498]).

Alpine Sun Lamp, general body baths, 1st degree erythema. Continue as Tonic Course.

References:

[495] Koeppe, L.—Die Diathermie und Lichtbehandlung des Auges (1919).
[496] Passow, A.—*Med. Klinik*, 1919, No. 51.
[497] Denman, I. O.—*Eye, Ear, Nose & Throat Monthly*, March, 1923.
[498] Denman, I. O.—*Eye, Ear, Nose & Throat Monthly*, July, 1923.
[499] Birch-Hirschfeld.—*Zs. f. Augenhlk.*, August, 1924.
[500] Denman, I. O.—*Jnl. Ophth. Otol. Laryngol.*, November, 1924.
[501] Birch-Hirschfeld.—*Strahlentherapie*, 1925, 19, No. 6.
[502] Esser, F.—*Deuts. Med. Ws.*, 1925, No. 40.
[503] Duke-Elder, W. S.—*Brit. Med. Jnl.*, May 29th, 1926 (gives bibliography).
[504] Hollender, A. R. & Cottle, M. H.—Physical Therapy in diseases of the Eye, Ear, Nose and Throat (21/-), 1926.
[505] Birch-Hirschfeld.—*Brit. Jnl. Actinotherapy*, October, 1927.
[506] Chamber, E. R. & Mayer, F. J. A.—*Brit. Med. Jnl.*, December 24th, 1927.
[507] Duke-Elder, W. S.—Recent Advances in Ophthalmology (12/6), 1927.
[508] Hoffmann, W.—*Klin. Monatsbl. f. Augenhlk.*, April, 1927, 78.
[509] Lingeman, E. L.—*Amer. Jnl. Phys. Therapy*, October, 1927.

510 Spiro, I.—*Brit. Jnl. Actinotherapy*, July, 1927.
511 Urbanek, J.—Lichttherapie des Auges (in Handbuch der Lichttherapie, Hausmann & Volk, 1927).
512 Barrowman, C.—*Brit. Jnl. Actinotherapy*, August, 1928.
513 Duke-Elder, W. S.—*Brit. Jnl. Ophthalmology*, June and July, 1928 (contains bibliography).
514 Harston, G. M.—*China Med. Jnl.*, July, 1928 (Abstract, *Brit. Jnl. Actinotherapy*, December, 1928).
515 Hume, O. G.—*Brit. Jnl. Actinotherapy*, August, 1928.
516 Spiro, I.—*Brit. Jnl. Actinotherapy*, June, 1928.
517 Duke-Elder, W. S.—*Brit. Med. Jnl.*, July 13th, 1929.
518 Nugent, O. B.—*Archives Phys. Therapy*, December, 1930 (*Quartz Lamp*, March, 1931).
519 Sputh, C. B.—*Phys. Therapeutics*, April, 1930.
520 Derer, J.—*Bratislavske Lekarske Listy*, January, 1932 (Abstract, *Brit. Med. Jnl.*, April 16th, 1932).
521 Hoffmann, W.—*Klin. Monatsbl. f. Augenhlk.*, April, 1932.
522 Linn, E. G.—*Archives Phys. Therapy*, April, 1932 (*Quartz Lamp*, S, October, 1932).
523 Nugent, O. B.—*Jnl. A.M.A.*, January 16th, 1932 (Abstract, *Quartz Lamp*, S, January, 1933).

Also Nos. 796 809 865 913

Orchitis (*see Epididymitis*).

Osteitis Deformans.

All reports available on this uncommon condition indicate that actinotherapy gives excellent results. 6-8 weeks of treatment usually restore full power of locomotion; the course of treatment should be repeated periodically. Calcium medication is advised as concomitant therapy.

Technique. General body baths with the Alpine Sun Lamp, general 1st degree erythema, with local irradiation for 2nd degree reaction over any enlarged joints. Continue as Tonic Course, with concomitant massage.

References:

524 Fraiken & Burill.—*Bull. Off. Soc. Francaise d'Electrotherapie*, March, 1925.
525 Nicory, C.—*Brit. Med. Jnl.*, March 15th, 1930.
526 Shillito, L.—*Brit. Jnl. Phys. Med.*, May, 1931.
527 Mudie, E. C.—*Brit. Med. Jnl.*, December 31st, 1932 (*Quartz Lamp*, S, April, 1933).

Also No. 790

Osteomyetitis.

American writers report complete healing of the sinus after a few local treatments, combined with a Tonic Course of general irradiation.

Technique. Kromayer Lamp, with applicator in cavity, to produce 2nd degree local reaction combined with Alpine Sun Lamp, general irradiation, 1st degree erythema, and continue as Tonic Course.

References: 845 846 913

Otitis Media.

"Our experience with radiant energy in the various types of otitis media extends over a large series of cases. We have limited its use to acute middle ear disease, with or without suppuration. Relief of otalgia is prompt. . . . The action of the light rays on the affected structure and on adjacent structures arrests the inflammatory changes, limits the infective process, and in many instances prevents complications, the most important of which is mastoiditis" (857).

Acute otitis media. Luminous heat irradiation with the Sollux Lamp and localizer, as close as can be tolerated (about 6 inches is usual), 30 minutes exposure. Repeat frequently (once to four times daily) until condition clears up.

Chronic purulent otitis media. Provided no definite surgical indications are present, ultra-violet therapy offers good prospect of curative results.

Technique. Cleanse the ear by suction and dry swabs. Instil mercurochrome solution (2-5 per cent.) and allow to remain in canal 5 to 15 minutes. Then wipe out excess and irradiate the canal, using Kromayer Lamp and suitable applicator, gradually withdrawing so that a definite reaction results along its length. Reaction should be vigorous but short of blister point.

Repeat every second day until discharge ceases. Concomitant general tonic measures (light baths, etc.) as indicated.

References:

[528] Oeken, W.—*Therapeut. Halbmonatshefte*, December 1st, 1920.
[529] Gerstenberger, H. J. & Dodge, C. T. J.—*Amer. Jnl. Dis. Children*, October, 1922.
[530] Hollender, A. R. & Cottle, M. H.—*Eye, Ear, Nose and Throat Monthly*, February, 1925.
[531] Hollender, A. R. & Cottle, M. H.—*Amer. Jnl. Phys. Therapy*, April, 1925.

Also Nos. 165 178 790 857 870

Ozæna.

Completely satisfactory results are obtained in mild cases. In atrophic cases, restoration cannot be effected, but foetor can be eliminated. The treatment requires patience and experience.

Technique. Kromayer Lamp, with applicators Nos. 508 and 507. Start the lamp first.

Desensitize the nostrils with cocaine/adrenalin. Remove mucus and crusts, taking care not to cause bleeding. Fix the head comfortably. Insert applicator 508 in nostril to full length required, then bring up and affix Kromayer burner when at full intensity. Protect the nostrils in the usual manner (see page 47). Give intensive irradiation; e.g., 10 to 15 minutes with Standard Kromayer to each nostril (withdrawing applicator steadily during the treatment). The more powerful the reaction produced on these insensitive membranes, the better the result.

Follow by irradiation of naso pharynx (using applicator 507) to produce mild reaction.

Repeat on subsidence, say 3 to 6 days later. About 10 treatments are generally sufficient. After 3-5 sessions special attention can be given to those areas where foetor persists (usually the centre of the duct, and fissures).

References: 246 618 796 864 870

Pemphigus Neonatorum.

Under actinotherapy, the blebs soon dry and disappear, and the general condition improves rapidly.

Technique. Alpine Sun Lamp, general body baths, distance 2 feet, time 3-5 minutes. Repeat every 2-3 days till lesion heals.

References:

[532] Gralka, R.—*Ms. f. Kinderheilkunde*, July, 1922 (*Quartz Lamp*, January, 1924).
[533] Gregorson, A. W.—*Lancet*, April 7th, 1928.

Also Nos. 262 905

Phlebitis.

Actinotherapy is contra-indicated in the acute or subacute stages (534), but gives brilliant and lasting results in chronic forms.

Technique. Sollux Lamp, luminous heat locally to affected limb in ordinary dosage, followed by Alpine Sun Lamp, locally to affected limb. Time, distance and intervals as stated for Therapeutic Course (page 37).

Combined general light baths (Alpine and Sollux Lamps together) on entire body for systemic effect, concurrently with local irradiations, on lines of Sedative Course (page 37) combined with passive exercises, warm baths, etc.

References:

[534] Savini, E. & Ackerman, S.—*Amer. Jnl. Phys. Therapy*, July, 1929 (*Quartz Lamp*, October, 1929).
[535] Savini, E.—*Wiener med. Ws.*, March 27th, 1926 (Abstract, *Quartz Lamp*, October, 1930).

Also Nos. 786 899

Pink Disease (*see Acrodynia*).

Pityriasis lichenoides chronica.

Ehrmann (536) records seven cases, completely cured by combined arsenical injections (cacodylate of arsenic), followed by brisk erythema irradiations with the quartz lamp.

Reference:

[536] Ehrmann.—*Derm. Zs.*, September, 1925.

Pityriasis rosea.

Actinotherapy ameliorates the itching immediately after the first treatment, and four to five exposures effect complete restoration of the skin to normal.

Technique. Alpine Sun Lamp, general body baths, 1st degree erythema. Continue as Tonic Course.

References: 795 885 886 887 892 896

Pleurodynia (*see Rheumatism*).

Poliomyelitis anterior.

Actinotherapy and other physical treatment are applied in the acute stages to remove the local infiltration and exudation present in the pia mater and spinal cord. The aim in treatment is to produce hyperæmia over the spine, throat and abdomen. If applied early and repeated frequently, this treatment offers prospects of good recovery.

In neglected cases also this treatment has proved beneficial, combined with general ultra-violet body baths to build up recuperative powers and with measures of electrical treatment as prescribed by a practitioner with special experience in these cases.

Technique (***Acute stage***). Large Sollux Lamp with open reflector, on back for 20-30 minutes, followed by same period on abdomen, then (using localizer) on throat. Produce deep hyperæmia on all areas. Keep the extremities warm during irradiation. Repeat at frequent intervals (e.g., every four hours) until symptoms of acute infection pass.

Static electricity to the lower spine and mechanical vibration are used in combination with the luminous heat.

Post-febrile cases. Alpine Sun Lamp, general body baths; 1st degree erythema doses, avoiding pigmentation.

Sollux Lamp, locally to affected muscle groups, 30-40 minutes daily. (Dr. Levick uses red filter for deeper penetration).

Combined with electrical stimulation and measures of re-education, applied by experienced operators.

Reference:

[537] Levick, G. M.—*Lancet*, August 15th, 1925.
[538] Armani, L.—*Raggi Ultravioletti*, February, 1926.
[539] Levick, G. M.—*Lancet*, June 11th, 1927.
[540] Feldman, L.—*Amer. Jnl. Phys. Therapy*, March, 1928.
[541] Snow, W. B.—*Phys. Therapeutics*, January, 1929.
[542] Levick, G. M.—*Brit. Med. Jnl.*, October 10th, 1931 (Extract *Quartz Lamp*, S, January, 1932).

Prostatitis.

Cases suitable for actinotherapy are those of chronic prostatic abscess with infection; enlarged prostate with negative smears but a long train of subjective disorders; derangement of prostate and seminal vesicles with accompanying impotency. Reduction of the gland to normal size and consistency with return of sexual power usually result.

Conditions of congestion and inflammation respond to luminous heat rays (Sollux Lamp) applied over the lower half of the abdomen and back, and the perineum in turn. This treatment may be combined with diathermy and will often serve to prevent abscess formation. Infection must be traced and suitably treated.

Technique. Kromayer Lamp, with applicator 554. Have the bowel clean (enema) and with patient standing and with body bent forward, moisten applicator with soapsuds. Insert applicator per rectum until in contact with gland, attach lamp and give 2nd degree reaction (e.g., Standard

Kromayer Lamp, 3 minutes). Some pain and tenderness will result ; there may be some blood on defœcation.

Repeat on subsidence of symptoms, probably 3-5 days later. Increase steadily up to 15 minutes' treatment ; 10 treatments is an average course.

Alpine Sun Lamp, general body baths, 1st degree erythema ; Tonic Course concomitantly with the local irradiations.

References:

[543] McCaskey, D.—*New York Med. Jnl.*, May 4th, 1921.
[544] Chaney, W. C.—*Amer. Jnl. Phys. Therapy*, June, 1926.
[545] Hall, P.—*Brit. Med. Jnl.*, February 4th, 1928.
[546] Titus, E. C. & Pederson, V. C.—*Lancet*, October 10th, 1931.
Also Nos. 793 882

Prurigo.

"Where the condition is intense and localized, the patients all derive benefit from as large a local dose of mercury vapour light as can be tolerated without acute discomfort" (903).

Technique. Alpine Sun Lamp, 2nd degree erythema over entire body if affected, or 3rd degree locally covering lesions. Continue as Therapeutic Course.

References: 844 903

Pruritis ani et vulvæ.

Actinotherapy offers to the dermatologist one of the most valuable adjuvants in treating these conditions. "It is an agent which allays the hyperæsthesia and allays the irritation, and has a definite curative influence ; used with intelligence, it is incapable of producing any harmful effects. . . As in many skin diseases benefit is obtained if general irradiation be added to local treatment" (548).

Technique. Carefully prepare the patient by cleansing parts of crusts, removing hair, etc. Warn that erythema may be severe, and advise a day's rest in bed.

Kromayer Lamp, contact, or at a few inches distance is most convenient ; 3rd degree erythema. Intervals 4, 3, 3, 4, 7, then 7 days ; 6 to 12 treatments are usually sufficient for permanent relief.

Alpine Sun Lamp, general body baths ; reaction according to patient's general condition.

Concomitant therapy for removal of underlying causes (colitis, infection, leucorrhœa, etc.).

References:

[547] Pitcher, H. F.—*Amer. Jnl. Electrotherapeutics*, February, 1922.
[548] Knuthsen, L. F. R. & Humphris, F. H.—*Lancet*, September 13th, 1930.
[549] Savill, A.—*Brit. Jnl. Actinotherapy*, December, 1930.
Also Nos. 329 390 841 848 881 896

Psoriasis.

A good proportion of cases rapidly regain normal skin. As with eczema, the varied forms of the disease necessitate different procedures of treatment ; and similarly, it is essential to avoid any severe erythema reaction in the acute eruption stages. Cases of para-psoriasis respond to actinotherapy ; very vigorous and protracted treatment is required (885).

Technique. Acute cases, first attack. Alpine Sun Lamp, general body baths. Sub-erythema reaction only if eruption is spreading rapidly ; continue as Sedative Course. No other external application to the skin.

Generalized or localized eruptions. Alpine Sun Lamp, general body baths, 1st-2nd degree erythema. Continue as Therapeutic Course ; at least three treatments at two weeks' intervals after clearance.

Resistant cases with hyperkeratotic plaques. Soften plaques and remove as far as possible (baths, coal-tar ointment, washed off before irradiation, etc.).

Kromayer Lamp locally to plaques. 4th degree reaction, covering healthy skin. The blue filter with a four-fold exposure will give deepest penetration for resorption of heavy crusts. Repeat as required. Combined with Alpine Sun Lamp, general body baths; 1st degree erythema, continued as Tonic Course.

Note.—Sensitization, either external or internal, has been found valuable. Dieffenbach (557), Westermann (916) *et al.* moisten the areas with a solution of common salt before irradiation. Goeckerman (564), applies crude coal-tar ointment washed off with olive oil. Oppenheim (560) practises photosensitization by Trypaflavin (5 ccm., 2 per cent. solution, intravenous, at 2-day intervals), coupled with general sub-erythema light baths.

References:

550 Chipman, E. D.—*Jnl. Amer. Med. Asscn.*, April 22nd, 1922 (*Quartz Lamp*, October, 1924).
551 Alderson, H. E.—*Archives Dermat. Syph.*, July, 1923 (*Quartz Lamp*, December, 1923).
552 Ballico, I.—*Raggi Ultravioletti*, May, 1925.
553 Castle, W. F.—*Practitioner*, May, 1925.
554 Swartz, J. H.—*Boston Med. and Surg. Jnl.*, July 23rd, 1925.
555 Ballico, I.—*Brit. Jnl. Actinotherapy*, June, 1926.
556 McKenna, R. W.—*Brit. Med. Jnl.*, August 27th, 1926.
557 Dieffenbach, W. H.—(ref. in *Brit. Jnl. Actinotherapy*, January, 1927).
558 Marceron, L.—*Paris Med.*, January 14th, 1928 (*Quartz Lamp*, May, 1928).
559 O'Donovan, W. J. *et al.*—*Brit. Jnl. Actinotherapy*, December, 1928.
560 Oppenheim, M.—*Strahlentherapie*, 1928, **29**, p. 268.
561 Platania, G.—*Raggi Ultravioletti*, 1929, Nos. 11-12.
562 Weinbren, M.—*Brit. Jnl. Actinotherapy*, February, 1929.
563 Jessen, H.—(Abstract) *Brit. Med. Jnl.*, March 29th, 1930.
564 Goeckerman, W. H.—*Arch. Derm. and Syph.*, September, 1931.

Also Nos. 793 795 804 836 853 885 894 895 896 898 905 916

Purpura.

After treating ten experimental cases of the idiopathic type with the quartz lamp, Sooy & Moise (565) report "results are favourable in comparison with other methods of treatment. The blood platelet count reaches normal values, which are maintained."

Kennedy's case (thrombocytopenic purpura in an adult) improved under light baths, but this was not sustained.

Technique. Alpine Sun Lamp on entire dorsal and ventral surfaces. Massive exposures (3rd degree erythema), repeated on subsidence (daily or alternate days), up to maximum exposures of 30 minutes at short distance, and course prolonged till results are established."

References:

565 Sooy, J. W. & Moise, T. S.—*Jnl. Amer. Med. Asscn.*, July 10th, 1926 (Abstract, *Quartz Lamp*, September, 1926).
566 Kennedy, A. M.—*Lancet*, August 1st, 1931.

Pyorrhœa.

If the pyorrhœa is a local symptom of a general condition, a permanent result will not be obtained until the systemic condition is duly treated. It is frequently advantageous to prescribe a course of whole body irradiation in such cases. No authority claims that irradiation will save all pyretic teeth. For example, pyorrhœa abscess near the apex, cutting off the blood supply, is regarded as hopeless. "But those cases which have not reached the hopeless stage will respond more rapidly to light treatment than to other chemical means" (Lippman 296).

Technique. Caution the patient that a temporary, severe local reaction will ensue. Do not use local anæsthetic before irradiation. Not more than four teeth should be treated at one session. Scale thoroughly, going as deeply as possible below gum margins. Apply ultra-violet radiation with compression to gums on both facial (using applicator No. 554) and lingual aspect (with applicator 506 or 553), to take in all the tissue between the teeth and up to the apex.

Produce heaviest possible reaction: Sampson (786) advises *double* the blister dose.

Repeat only on subsidence—after five or six days.

References:

[567] Daly, J. H.—*Dental Cosmos*, March, 1922.
[568] Schumann, H. H.—*Chicago Dental Soc. Bull.*, January 17th, 1922.
[569] Gillet, F. A.—*Jnl. Radiology*, June, 1924 (Abstr. *Quartz Lamp*, May, 1925).
[570] Folstein, I. L.—*Dental Cosmos*, February, 1925.
[571] Price, J. A.—*Amer. Jnl. Phys. Therapy*, September, 1925.
[572] Spring, W. A.—*Oral Topics*, February, 1926.
Also Nos. 296 298 306 786 857

Raynaud's Disease.

There is invariably a state of low resistance in addition to the local symptoms. Actinotherapy gives marked effects in improving vasomotor tone.

Technique. Combined irradiation :—First, mild luminous heat radiation to extremities (1,000 watt Sollux Lamp with open reflector at distance of 24-30 inches, for 30 minutes). Sudden overheating will cause discomfort.

Followed by Alpine Sun Lamp, general body baths, 1st degree erythema.

In severe cases, follow up by Alpine Sun Lamp, applied to hands and feet, 2nd-3rd degree local erythema.

References:

[573] Wilson, J.—*Brit. Med. Jnl.*, January 1st, 1927.
[574] Brooke, C. R.—*Phys. Therapeutics*, April, 1929.

Rheumatism.

In a condition so obscure in origin and so diverse in its forms, it is obvious that actinotherapy alone cannot be a main part of treatment in all cases. Individual diagnosis, and treatment with intelligent combination of remedies, are essentials. Actinotherapy is of great value in many cases ; this outline can only indicate the main lines for its application.

Those forms of rheumatic disease in which actinotherapy has been effectively applied are the following :—

Non-articular forms :
Myalgia, including fibrositis, pleurodynia, and torticollis.
Lumbago (q.v.)
Neuritis and sciatica (q.v.)

Chronic Joint changes :
Arthritis, rheumatoid (q.v.)
Gout (q.v.)

Reference should be made to the other sections indicated.

Acute Myalgia, Fibrositis, Torticollis, etc.

Immediate relief and abortion of the attack usually results from adequate exposure to luminous heat rays, followed by an erythema reaction with ultra-violet.

Technique. Sollux Lamp, locally on affected area, 30 minutes' irradiation to tolerance, followed by Alpine Sun Lamp, 1st degree reaction (remember that skin of hyperæmic area will react strongly). Repeat as required.

Chronic forms. The technique of actinotherapy varies according to the patient's condition (580). With debilitated, tubercular and nervous patients, use a combination of light treatment as below :—

Alpine Sun Lamp, general body baths, sub-erythema doses, continued as Sedative Course, and avoiding erythema, combined with Sollux Lamp, locally to affected areas. With more robust patients, a more vigorous technique is adopted :—

Alpine Sun Lamp, general body baths, sub, mild, and 1st degree erythema, at 2-day intervals. Intermit for a week. These are combined with Kromayer (or Alpine) Lamp, 2nd-3rd degree erythema doses on affected joints.

Dr. Van Breemen (579) classifies the causal factors, and the corresponding lines of actinotherapy treatment, as follows :

Focal Infections. Diagnosis and treatment as required.

Rheumatic diathesis. Ultra-violet therapy alone, applied as weak general irradiations; if found ineffective after 20 exposures, then combined with local 4th degree reactions.

Deficient Skin Circulation. General body baths of combined ultra-violet and luminous heat.

Septic focus. In about 75% of his cases, Dr. Hindley-Smith (582) has determined a chronic focus of streptococcal infection in the tonsils and nasal pharynx. This is dealt with by local irradiation on the following lines:—

Technique. Kromayer Lamp with applicators (1) 510 to each tonsil, (2) 507 to naso-pharynx, (3) 508 to each nostril. Produce 1st degree erythema on entire mucosa. Repeat every 3rd to 5th day, depending on previous reaction.

Prophylaxis. Drs. L. J. Llewellyn and A. B. Jones (583) suggest that rheumatism is due to inborn instability of the temperature-regulating mechanism. They urge the use of actinotherapy (general body baths) as a prophylactic measure, both for mothers of rheumatic disposition and for pre-rheumatic infants.

References:

575 Cipriani, M.—*Raggi Ultravioletti*, November, 1928.
576 Deck, E. J.—*Actinic Practitioner*, December, 1928.
577 Buckley, C. W. *et al.*—*Proc. Royal Soc. Med.*, May, 1929.
578 Dausset, H., Lucy, —, Van Breemen, J.—Le traitement des rheumatismes par les rayons infra-rouges (Paris : Institut d'Actinologie, 1929).
579 Van Breemen, J.—*Brit. Jnl. Actinotherapy*, January, 1930.
580 Cawadius, A. P.—*Brit. Jnl. Actinotherapy*, August, 1930.
581 Deck, E. J.—*Brit. Jnl. Actinotherapy*, March, 1931.
582 Hindley-Smith, J. D.—*Brit. Jnl. Phys. Med.*, October, 1931 (*Quartz Lamp*, S, January, 1932).
583 Llewellyn, L. J. & Jones, A. B.—*Brit. Jnl. Phys. Med.*, December, 1931 (*Quartz Lamp*, S, January, 1932).
583a Hindley-Smith, J. D.—Chronic Rheumatism and the pre-rheumatic state (5/6). 1932.
584 Jones, A. B.—*Brit. Jnl. Phys. Med.*, January, 1932.
Also Nos. 215 792 797 806b 809

Rhinitis (*see Catarrh, Nasal*).

Rickets.

"To-day rickets has become the established criterion for appraising the biological action of ultra-violet rays in the region of 300 millimicrons" (589).

Actinotherapy is established as a specific in this condition. Since the discovery of this fact independently by Huldschinsky (Berlin) and Hess (New York) in 1919, a vast literature on the subject has been developed. Only the more important items dealing with treatment by direct irradiation are noted below; a list is given in Dr. Hess's standard work (589).

It may be appropriate to refer to the indirect treatment of rickets, i.e., the ingesting of suitable food substances, which contain vitamin D. The method of direct treatment by irradiation of the children, and still more by prophylactic irradiation of the expectant mother also, is favoured by those who have clinical experience of both methods. "It should be remembered that exposure of rachitic children to ultra-violet light not only cures the rickets, but has many other beneficial effects, the most important being the great improvement of the child's general health and its release from the dangerous catarrhal state" (606).

Prophylactic irradiation has especial value in rickets. Applied to the expectant mother, it is an important factor in maintaining active calcium metabolism, thus promoting skeletal development of the fœtus. Further, it is found to maintain muscle tone and to obviate toxæmia. After birth, irradiation of the nursing mother assists lactation and assures natural nutrition for the child; and a course of light baths safeguards the infant against rickets.

In dealing with severe cases, probably from poor homes, it is essential to secure regular attendance and to ensure suitable dietary.

Up to the age of three years, infants do not show normal erythema reactions. The dosage below is therefore outlined as a minute-inch technique, for an Alpine Sun Burner in new condition.

Technique. Alpine Sun Lamp, general body baths; distance 40 inches; time 3 minutes each side for first irradiation. At intervals of three days, increase dosage by 2 minutes each time up to a maximum of 10 minutes each side.

Huldschinsky recommends that the course should be spaced over a period of months equal to the child's age in years.

References (selected):

585 Medical Research Council.—Studies of Rickets in Vienna (1923, 7/6).
586 Huldschinsky, K.—The Ultra-violet Light Treatment of Rickets (1926, 6d.).
587 Gamgee, K. M. L.—The Artificial Light Treatment of Children in Rickets, Anæmia and Malnutrition (1927, 10/6).
588 Blunt, K. & Cowan, R.—Ultra-violet Light and Vitamin D in Nutrition (1930, $2.50).
589 Hess, A.—Rickets, including Osteomalacia and Tetany (1930, 25/-).
590 Palm, A.—*Practitioner*, October-November, 1890.
591 Hess, A. & Unger, L. J.—*Jnl. Amer. Med. Asscn.*, January 24th, 1920.
592 Hess, A.—*Amer. Jnl. Dis. Children*, August, 1921.
593 Hess, A.—*Jnl. Amer. Med. Asscn.*, April 22nd, 1922.
594 Hess, A. & Weinstock, M.—*Jnl. Amer. Med. Asscn.*, March 10th, 1923.
595 Peemoller, F.—*Strahlentherapie*, 1925, **20**.
596 Gambara, L.—*Raggi Ultravioletti*, Sept.-Nov., 1925.
597 Pflüger, W.—*Aerzliche Rundschau*, December 15th, 1925.
598 Banks, S.—*Med. Officer*, March 6th, 1926.
599 Hess, A.—*Phys. Therapeutics*, June, 1926.
600 Peemoller, F. & Dannmeyer, F.—*Strahlentherapie*, 1927, **24**, p. 378.
601 Wieland, E.—*Praxis*, January 4th, 1927.
602 Wieland, E.—*Schweizer. Med. Ws.*, January 10th, 1927.
603 Wieland, E.—*Fortschritte d. Med.*, June 30th, 1927.
604 Parsons, L. G.—*Archives Dis. Childhood*, August, 1927.
605 Hess, A. & Anderson, W. T.—*Jnl. A.M.A.*, October 8th, 1927.
606 Banks, S.—*Brit. Med. Jnl.*, February 11th, 1928.

607 Parsons, L. G.—*Lancet*, September 1st, 1928.
608 Selkirk, T. K. *et al.*—*Jnl. A.M.A.*, December 29th, 1928 (*Quartz Lamp*, February, 1929).
609 Gerstenberger, H. J. & Hartman, J. I.—*Jnl. A.M.A.*, February 2nd, 1929 (*Quartz Lamp*, March, 1929).
610 Tixier, D.—*Med. Press*, August 13th, 1930.
611 Volmer, H.—*Klin. Ws.*, December 6th, 1930.

Also Nos. 253 255 260 796 811b 814b

Ringworm (*see Tinea*).

Scalds (*see under Burns*).

Sciatica (*see Neuritis*).

Scleritis (*see Ophthalmology*).

Scleroderma.

The few reports available state that results from irradiation were satisfactory, but give no details of technique.

References:

612 Ianichewski, A. E.—Abstract in *Physical Therapeutics*, February, 1927.
613 Louste, Juster, David.—Abstract in *Physical Therapeutics*, October, 1928.

Sclerosis.

Dr. Hernaman-Johnson reports a case of some years standing treated during a year with light baths, and so improved that practically normal locomotion was regained. The improvement lasted during four years.

Laqueur (856) recommends actinotherapy for alleviating the spastic symptoms and locomotor disturbance.

Technique. Alpine Sun and Sollux Lamps, general light baths, sub-erythema doses. Continue as Sedative Course.

References:

614 Hernaman-Johnson, F.—*Brit. Jnl. Actinotherapy*, July, 1930.

Also No. 856

Seborrhoea.

Nagelschmidt (195) states he has treated a number of cases of seborrhoea (not accompanied by alopecia) and found that one or two mild radiations cleared it up permanently.

O'Donovan (903) mentions the severe forms in which the whole scalp is affected ; he recommends X-ray epilation as a primary measure for these, before the actinic irradiation.

It is advisable to give the scalp a spirit shampoo before irradiation. Long hair will require thorough combing during irradiation to ensure exposure of the scalp.

Technique. Local irradiation with Alpine Sun Lamp, 1st degree erythema reactions, and continue as Tonic Course.

Sulphur ointment may be applied between exposures.

Seborrhoeic dermatitis and infiltrated patches may require more severe reactions (2nd to 3rd degree erythema if plaques are associated with the papular dermatitis).

References: 195 795 885 887 889a 894 903

Shingles (*see Herpes Zoster*).

Sinusitis.

In the acute cases luminous heat should be administered directly over the face, followed by local and general actinotherapy. This usually relieves pain within a short time and if persisted in will relieve many of these cases without resorting to surgery. In the old chronic cases of empyema where adequate drainage cannot otherwise be established, surgery must be resorted to, but following this actinic rays and luminous heat are the best measures for restoring the infected mucous membrane to normal. The prognosis is usually good unless there is a mixed infection or other complications.

Technique. ***Acute cases.*** Sollux Lamp with localizer directly over face (protect the eyes) for minimum of 30 minutes at tolerable distance. Increased discharge, decrease of pus, and relief of pain should follow. Repeat this daily or twice daily according to symptoms.

Kromayer Lamp with applicator 508 to produce visible erythema in all nasal mucosa, especially over sinus openings, to shrink the membrane and increase drainage. Repeat on subsidence of the erythema. Acute cases may require from one to four weeks.

Chronic Sinusitis. Promote drainage by luminous heat or diathermy. Kromayer Lamp, following technique outlined above. Repetition, at 3-day intervals, will be necessary for some weeks for final results. Improvement results in a large proportion of cases.

References:

615 Hollender, A. R. & Cottle, M. H.—*Amer. Jnl. Phys. Therapy*, March, 1926.
616 Plank, T. H.—*Med. Herald*, August, 1928 (*Quartz Lamp*, August, 1928).
617 Brooke, C. R.—*Phys. Therapeutics*, June, 1929.
618 Reaves, R. G.—*Archives Phys. Therapy*, November, 1929. (*Quartz Lamp*, February, 1930).
619 Feldman, L.—*Brit. Jnl. Actinotherapy*, December, 1930.

Also Nos. 345 786 845 857 864 865 873

Spasmophilia (*see Tetany*).

Stomatitis (Infectious).

Technique. Clean the teeth thoroughly ; examine for the most infected area.

Using the Kromayer Lamp with applicator 554 and 555, give a 3rd degree reaction, both on the facial and lingual surfaces. Not more than three posterior teeth should be included at one time, to avoid after-complaint of the reaction.

After the three posterior teeth have been treated, an open-mouth irradiation for all the teeth should immediately follow at the same sitting. For this, applicator 555 should be used. Give 2nd degree reaction. Only treat one jaw at a time ; the most infected first. Allow reaction to clear up before repeating.

Boric acid should be used frequently as a mouth wash after treatment. Swab with mallophene or similar solution.

When the 3rd degree reaction has cleared up, take another three teeth and repeat treatment. Continue this until all infected teeth have been irradiated. Repeat this procedure, starting with the first irradiated teeth.

The more severe the infection, the longer the exposure time necessary, and the heavier reaction.

References: 305 306 307

Sycosis.

In the early stages, actinotherapy effects rapid clearance. Cases of long standing require vigorous treatment and perseverance. Treatment should continue for a considerable time after the last lesion disappears, to obviate relapse.

Technique. Kromayer or Alpine Sun Lamp locally on lesion and small margin of normal skin. Hair should be cut very short before irradiation. Produce vigorous 3rd degree erythema. Repeat on subsidence, increasing dose to repeat reaction at each treatment. Continue after the condition is apparently cleared up.

References:

[620] Marchesini, C.—*Raggi Ultravioletti*, July, 1929.
Also Nos. 325 793 844 885 887 894

Synovitis *(see Bursitis).*

Book No. 620

Syphilis.

Actinotherapy is an invaluable adjuvant in the treatment of syphilis. It quickly relieves the anæmia and increases the defensive mechanism of the blood. It is most valuable administered in conjunction with specific therapy (salvarsan), etc., and where this cannot be tolerated, a course of light baths will build up the general condition and the reactive powers of the organism. As a stimulus to the skin functions, and particularly to its capacity of forming antibodies ("esophylaxis") actinotherapy is of special value in preventing the development of tabes and G.P.I.

Technique. ***Ulcers, gummata.*** Kromayer Lamp, locally to lesions, 4th degree reaction, covering healthy skin. Repeat at short intervals (2-3 days).

Primary Syphilis. In conjunction with neosalvarsan or other specific treatment:—

Alpine Sun Lamp, general body baths, 1st degree erythema, repeated at 2-3 day intervals.

Kromayer Lamp to infected glands (following technique described under "Chancroid").

Secondary Syphilis. If the patient is not responding well to specific therapy, this should be intermitted for a few weeks. During this period, general light baths with the Alpine Sun Lamp are given. If the patient is sensitized to mercury (see p. 41) dosage must be cautious to ascertain personal reaction. Definite 1st or 2nd degree erythema at each session, short intervals (2-3 days only). When the general condition (weight, anæmia, cachexia, etc.) shows definite improvement, specific therapy can be recommenced in conjunction with actinotherapy.

Chronic Syphilis. In inveterate cases which are refractory to specific therapy, or showing cardiovascular or neural involvment, good results are obtained from actinotherapy in conjunction with injections of autogenous blood. No specific therapy is administered during this treatment. Sixty-two cases are reported by Drs. Rajka and Radnai of the Budapest Polyclinic (629). Their technique is briefly as below :—

Alpine Sun Lamp, ultra-violet irradiation of the entire body with erythema doses, three times weekly, thirty times in all. The course of irradiations lasts, therefore, ten weeks at least.

Blood is withdrawn and reinjected intragluteally in increased doses (2 to 15 c.cm). For intracutaneous application, the serum or blood is injected in two places into the skin of the back in doses of 0.1 to 1 c.cm. In all, twenty blood injections, in two series, are given half-an-hour before each of the first ten and last ten irradiations.

References:

[621] Breiger, F.—Die Heilwirkung des Lichtes auf Geschlechtskrankheiten (1920, 1.50 M.).
[622] Ballico, I.—Elioterapia e Fototerapia delle malattie celtiche e della Pelle (1927, 18 lire).
[623] Hesse, E.—*Strahlentherapie*, 1921, 12.
[624] Huldschinsky, K.—*Brit. Jnl. Actinotherapy*, April, 1927.
[625] Pope, C.—*Phys. Therapeutics*, June, 1927.
[626] Rajka, E. & Radnai, E.—*Wiener Klin. Ws.*, 1928, No. 2.
[627] Richter, W.—*Munch. med. Ws.*, February 1st, 1929 (Abstr. *Brit. Jnl. Actinotherapy*, May, 1929).
[628] Rajka, E. & Radnai, E.—*Monats. Ungarischer Med.*, 1930, No. 7.
[629] Rajka, E. & Radnai, E.—*Ann. Derm. et de Syphilgraphie*, September, 1931 (*Quartz Lamp*, S., April, 1932).

Also Nos. 77 790 796 831

Telangiectases (*see also Acne Rosacea*).

Hazen (630), who reports on eight cases of X-ray telangiectasis, states that "in no instance have more than two treatments been necessary to obliterate the vessels in the area treated. The results are a complete disappearance of the dilated blood-vessels, but naturally the atrophy of the skin remains unchanged and usually the result in appearance is that of a small, slightly whitened scar."

The rays have a selective action on the vessels. Hence the more vascular the lesions, the better will be the result.

Fox reports one case of Angioma serpignosum, Bernstein one of A. cavernosum, successfully treated on similar lines. Kromayer (159a) recommends the blue filter.

Technique. Kromayer Lamp, window (or compression lens) in firm contact with lesion under pressure. Powerful reaction (e.g., 30 minutes with Standard Lamp), repeated at 3 weeks' intervals.

References:

[630] Hazen, H. H.—*Amer. Jnl. Roentgenology*, February, 1922 (*Quartz Lamp*, May, 1924).

Also Nos. 159a 793 885 889a 906

"Tennis Elbow" (*see Epicondylitis*).

Tetany, Infantile.

The effects of actinotherapy in raising and fixing serum-calcium content accounts for its specific effects in tetanic states. It should be noted that over-stimulation by actinic rays may exacerbate symptoms at the outset. On this account dosage should be carefully regulated.

The use of palliatives (HCl, etc.) is not contra-indicated, and administration of calcium salts is valuable as a concomitant measure.

Technique. Alpine Sun Lamp, general body baths, two minutes each side at 20 inches distance. Repeat daily for about 14 treatments, according to progress of the individual case.

References:

[631] Hoag, L. A.—*Amer. Jnl. Dis. Children*, August, 1923 (*Quartz Lamp*, September, 1923).
[632] Flesch, H.—*Deutsche Med. Ws.*, November 14th, 1924.
[633] Stern, R.—*Zs. f. d. ges. Phys. Therapie*, 1924, 28, No. 4.

634 Woringer, P.—*L'Ultra-violet*, October, 1924.
635 Ferri, U.—*Policlinico*, January 12th, 1925 (Abstract, *Quartz Lamp*, October, 1925).
636 Pflüger, W.—*Aerztliche Rundschau*, January 15th, 1925.
637 Valdanieri, A.—*Raggi Ultravioletti*, April, 1925 (Abstr. in *Mod. Sunlight*, May, 1926).
638 Russell, E. P.—*Amer. Jnl. Phys. Therapy*, June, 1925.
639 Mouriquand, B.—*L'Ultra-violet*, July, 1925.
640 Bakwin, H. & R. N.—*Jnl. Amer. Med. Assn.*, August 9th, 1930.

Also Nos. 252 253 255 260 589 596 796

Tinea (*Trichophyton infections*).

Diagnosis. Filtered ultra-violet rays give great assistance to the diagnosis of this condition by fluorescence. The test can be applied with the Alpine Sun Lamp, using the diagnosis filter ; or with one of the special lamps made for fluorescence tests. In a darkened room, hairs or skin infected with the microsporon will show up in green fluorescence so brilliant that each single infected hair can be picked out.

References:

641 Bommer, S.—*Derm. Ws.*, May 8th, 1926.
642 Vigne, P.—*Marseille Med.*, November 15th, 1926 (*Brit. Jnl. Actinotherapy*, January, 1927).
643 Fuhs, H.—*Derm. Zs.*, 1927, 50, No. 1.
644 Rawlinson, E. G.—*Jnl. State Med.*, September, 1927.
645 Hill, N. G.—*Brit. Jnl. Children's Diseases*, January, 1928.
646 Hill, N. G.—*Brit. Jnl. Actinotherapy*, August, 1928.
647 Severn, A. G. M.—*Med. Officer*, March 16th, 1929.
648 Goodman, H.—*New York State Med. Jnl.*, May 1st, 1929.
649 Mitchell, H. M.—*Medical World*, April 4th, 1930.
650 Kinnear, J.—*Brit. Med. Jnl.*, May 9th, 1931.

Also Nos. 85 88

Treatment. The trichophyton fungus yields readily to actinotherapy, whether on the scalp, the body generally, or in the crural regions. Strenuous reactions are essential. The procedure is painless and free from the danger or discomfort associated with X-ray epilation or thallium acetate treatment.

Technique. Kromayer Lamp, at 2 inches distance. Produce vigorous 4th degree reaction on the affected area and margin, protecting the healthy skin. One treatment is sufficient in most cases.

References:

651 Scholtz, M.—*Med. Jnl. and Record*, April 7th, 1926 (Abstract *Quartz Lamp*, May, 1926).

Also Nos. 786 790 885

Tinea Versicolor (*Microsporon furfur*).

Provided that a marked erythema is produced, a single irradiation will destroy this infection.

Technique. Alpine Sun Lamp, 2nd degree erythema over all lesions. Repeat only if required.

References:

652 Storey, A. A. & Kime, E. N.—*Amer. Jnl. Phys. Therapy*, November, 1925.

Also Nos. 885 896

Tonsillitis : Tonsillar Sepsis.

Actinotherapy provides a means of dealing with many cases of chronic tonsillar infections. Four to six repetitions of a 2nd degree erythema on the glands will largely clear up the local sepsis. Where the condition is connected with general rheumatic or toxæmic states, these local reactions may cause temporary exacerbation of the general symptoms. This is usually of good prognosis.

In acute tonsillitis, luminous heat is a valuable addition.

Tonsillitis. "Rest in bed, catharsis and other accepted measures are not to be replaced but supplemented by actinotherapy. If the constitutional symptoms are negligible, ultra-violet light to the tonsils will probably reduce the inflammatory process" (857).

Technique. Kromayer Lamp, with applicator 510. Produce 2nd degree reaction (e.g., 20 seconds contact with the Standard Kromayer Burner each side) stroking the "stirrup" gently over the gland surface during treatment. Reactions on the anterior pillar cause severe discomfort and should be avoided. Remove applicator, and give 2nd degree erythema on outer skin over each tonsil. Repeat on subsidence. If pain is marked, precede this treatment by luminous heat applied locally over tonsils to produce mild hyperæmia.

Tonsillar Sepsis. Chronic cases require more prolonged treatment. The aim is to produce powerful reaction ; this will be a 2nd or 3rd degree erythema according to the patient's tolerance.

Technique. Kromayer Lamp, with applicator 510 ; 2nd-3rd degree reaction on each tonsil as outlined above.

Repeat on subsidence, i.e., 3-5 days later. Increase dosage to produce reaction at each session, for course of six treatments. Interpose a break of some weeks before repeating course if indicated.

References:

[653] Denman, I. O.—*Amer. Jnl. Clin. Med.*, January, 1924.
[654] Foster, R. A.—*Brit. Jnl. Phys. Med.*, June, 1931.
Also Nos. 330 582 857 859 864 872 873 875

Torticollis (*see Rheumatism*).

Trachoma (*see Ophthalmology*).

Tuberculosis.

In all forms of tuberculosis, actinotherapy has brought improvement in the prognosis. Many cases of lupus, adenitis, etc., can now be satisfactorily treated as out-patients without interference to their home or employment. Actinotherapy should be both prescribed and supervised by a physician with special experience. It is important that the patient's reaction be closely controlled ; underdosage will be ineffective, overdosage may retard cure. Technique (stated below under different sections) cannot be rigidly laid down ; treatment must be individualized.

Prophylaxis. Certain writers point out the value of actinotherapy as a preventative measure for children and others exposed to tubercular infection. Brunthaler's excellent results in this direction (579) indicate that large-scale measures are well worth while.

Those books and papers which discuss tuberculosis in several forms are listed below. Other lists will be found under special headings (q.v.) :—

Adenitis, tubercular.
Lupus vulgaris.
Tuberculosis, intestinal.
,, peritoneal.
,, laryngeal.
,, pulmonary.
,, renal.
,, " surgical."
,, verrucosa.

References:

[655] Gassul, R.—Die Bedeutung der verschiedenartigen Strahlen fur die Diagnose und Behandlung der Tuberkulose, 1921.
[656] Mayer, E.—Clinical application of Sunlight and Artificial Radiation, with special reference to Sunlight (1926, 45/-). (An encyclopædic presentation, with very complete bibliography).
[657] MacNalty, A. S.—A report on Tuberculosis, including an examination of the results of Sanatorium Treatment. (Ministry of Health Report, 1932, 3/-).
[658] Hyde, C. L. & Lograsso, H.—*New York Med. Jnl.*, January 6th, 1917.
[659] Plank, T. H.—*Nat. Phys. Therapeutic Soc., Detroit*, June 20th, 1918.
[660] Polak, R.—*Prakticky Lekar*, 1923, No. 8.
[661] Oppenheim, L.—*La Clinique*, February, 1924.
[662] Gerstenberger, H. J. & Wahl, S. A.—*Jnl. Amer. Med. Assn.*, November 22nd, 1924.

663 Donnelly, L. C.—*Amer. Jnl. Phys. Therapy*, December 1924
664 Chapman, W. B.—*Clinical Med.*, July, 1925.
665 Hyde, C. L.—*Ohio State Med. Jnl.*, December, 1925.
666 Smith, A.—*Brit. Jnl. Actinotherapy*, August, 1926.
667 Marcus, J. H.—*Med. Press*, September 29th, 1926.
668 Crocket, J.—*Tubercle*, October, 1926.
669 Mayer, E.—*Archives Phys. Therapy*, November, 1926.
670 Gauvain, H. & Bannerman, R. G.—*Med. Annual*, 1927.
671 M'Gowan, T., in *Report M.O.H., Glasgow*, for 1927.
672 Cox, G. L.—*Report of Lancs. C.C. Central Tuberculosis Officer*, June, 1927.
673 Murray, J. O.—*Brit. Jnl. Actinotherapy*, June, 1927.
674 Reyn, A.—*Phys. Therapeutics*, December, 1927.
675 Cox, G. L.—*Jnl. Royal Sanitary Inst.*, February, 1928.
676 Cox, G. L.—*Report of Lancs. C.C. Central Tuberculosis Officer*, July, 1928.
677 Brunwin, A. D. & Stewart, L.—*Tubercle*, October, 1928.
678 Sutherland, D. P.—*Report of Senior Tuberculosis Officer, Manchester*, 1928.
679 Brunthaler.—*Die Tuberkulose*, 1929, No. 7.
680 Cox, G. L.—*Brit. Jnl. Tuberculosis*, January, 1929.
681 Cox, G. L.—*Brit. Jnl. Actinotherapy*, October, 1929.
682 Wilson, J.—*Brit. Jnl. Bio-Physics*, August, 1929.
683 Eidinow, A.—*Brit. Jnl. Tuberculosis*, January, 1930.
684 Dufestel, L. G.—*Bull. Med.*, May 24th, 1930.
685 Kobak, D.—*Archives Phys. Therapy*, June, 1930.
686 Murray, J. O.—*Brit. Jnl. Actinotherapy*, October, 1930.
687 Cox, G. L.—*Report of Lancs. C.C. Central Tuberculosis Officer*, 1931 (*Quartz Lamp*, S, January, 1933).
688 Jessel, G.—*Lancet*, May 30th, 1931.
689 Chapman, W. B.—*Amer. Jnl. Phys. Therapy*, June, 1931.
690 Chapman, W. B.—*Amer. Jnl. Phys. Therapy*, September, 1931.
691 Toussaint, C. H. C. & MacIntyre, E. J.—*Brit. Jnl. Phys. Med.*, November, 1931.

Also No. 804

Tuberculosis, Intestinal.

Benefits are considerable in about 70 per cent. of the cases reported by numerous authorities. Pain, fever, diarrhoea and nausea are usually relieved during the first month of actinotherapy. In addition to the literature noted below, reference should be made to the summary in Mayer's work (656).

Technique. Alpine Sun and Sollux Lamps, general light baths, sub-erythema reaction on whole body (watch for rise of temperature in pulmonary cases).

Alpine Sun Lamp, locally over abdomen, 1st to 2nd degree erythema. Repeat every 2-3 days.

Continue treatment for two to three months at least.

References:

692 Stewart, D. A.—*Canad. Med. Assn. Jnl.*, January, 1923.
693 Pritchard, J. E.—*Canad. Med. Assn. Jnl.*, 1924, p. 145.
694 Erickson, R. J.—*Amer. Rev. Tuberculosis*, September, 1925.
695 Brown, L. & Sampson, H. L.—Intestinal Tuberculosis; its Importance, Diagnosis and Treatment, 1927.
696 Kettelcamp, G. D.—*Archives Phys. Therapy*, September, 1931 (*Quartz Lamp*, October, 1931).
697 Goldberg, B.—*Archives Phys. Therapy*, December, 1931 (*Quartz Lamp*, N, January, 1932).

Also Nos. 656 670 796 902

Tuberculosis, Peritoneal.

The serous and fibrinous forms respond well to actinotherapy, especially in children and early cases. Forms showing ulceration and large caseous lymph nodes are less satisfactory. Finkelstein (698) after 10 years' experience reports 85 per cent. successes in children. In Mayer's adult cases (656), fluid diminished in four and disappeared in six months.

Technique. Alpine Sun Lamp, 30 to 40 inches distance, 1st degree erythema, repeated every 2 to 3 days. Two-three months' course of treatment is usually required. Patients suffering from this form of tuberculosis react more strongly than those with bone tubercle; careful supervision is therefore required. Special precautions in cases of pulmonary tuberculosis (q.v.).

References:

698 Finkelstein, H. & Rohr, F.—Die Behandlung der Tuberkulosen Bauchfellerkrankungen in Kindesalter, 1922.
699 Peters, C. A.—*Canadian Med. Assn. Jnl.*, December, 1924.
700 Laqueur, A.—*Phys. Therapie*, 1926, No. 2.

701 Pletnew, D.—*Zs. f. d. ges. Phys. Therapie*, 1926, **31**, No. 2.
702 Hunter, T. C.—*Lancet*, October 13th, 1928.
703 Brody, Bernhard, *et al.*—Le traitement de la péritonite tuberculeuse par la lumière. (Paris: Institut d'Actinologie, 1929).
704 Chiertz, O.—*Brit. Jnl. Actinotherapy*, October, 1930.

Also Nos. 662 668 671 682 788 796 820 824 835

Tuberculosis, Laryngeal.

Dr. Cemach (706 709 716 870) obtains about 60 per cent. clinical cures in this condition. The combination of general irradiation to build up the organic resistance combined with local irradiation to check the laryngeal ulcer and effect restoration of function is found most effective.

Technique. Desensitize the epiglottis by painting with cocaine or other anæsthetic. Deal with saliva (saliva pump or a tabloid of atropin-calcium) and alleviate any cough.

Kromayer Lamp with laryngeal applicator (or the special throat quartz lamp) introduced to give direct irradiation on the diseased area. Produce visible erythema (e.g., Standard Kromayer Lamp, 1-2 minutes). In cases of dysphagia use blue filter (3-5 minutes).

Repeat once weekly, increasing gradually up to 10 minutes maximum.

Alpine Sun Lamp, general body baths, repeated two to three times each week, carefully regulated to patient's condition and concomitant symptoms (pulmonary tuberculosis, etc.).

References:

705 Mayer, E.—*Amer. Rev. Tuberculosis*, 1921, No. 10.
706 Cemach, A. J.—*Zs. f. Hals. Nasen Ohrenheilkunde*, 1924, **10**, 270-277.
707 Ostermann.—*Wiener Med. Ws.*, 1924, No. 36.
708 Leicher, H.—*Zs. f. Laryngologie*, 1925, **13**, No. 4-5.
709 Cemach, A. J.—Die Leistungsfahigkeit der Phototherapie der Kehlkopftuberkulose (in Die extrapulmonale Tuberkulose 1926, 2 Teil, No. 9).
710 Strandberg, O.—*Lancet*, November 27th, 1926.
711 Jelinek, M.—*Ms. f. Ohrenheilkunde*, 1928, **62**, 63-81.

712 Plum, A.—*Ugeskrift for Laeger*, March 15th and 22nd, 1928 (Abstr., *Brit. Med. Jnl.*, June 9th, 1928).
713 Eidinow, A.—*Proc. Royal Soc. Med.*, February, 1929.
714 Glenn, E. E., & McGinnis, B. J.—*Jnl. Missouri State Med. Assn.*. January, 1930 (*Quartz Lamp*, April, 1930).
715 Miller, J. W.—*Archives of Otolaryngology*, March, 1931 (*Quartz Lamp*, August, 1931).
716 Cemach, A. J.—*Strahlentherapie*, 1932, **43**, 547-564 (*Quartz Lamp*, S, January, 1933).

Also Nos. 656 661 796 870

Tuberculosis, Pulmonary.

This condition in itself is not a contra-indication for actinotherapy. The contra-indications are best summed up in Rollier's words: "When a patient is very weak with much toxæmia and hectic fever, the sun bath is liable to do more harm than good." Miliary tuberculosis is a definite contra-indication.

The effects of irradiation are non-specific; its action is a mobilization of the forces of general resistance. Hæmoptysis, if it occurs, is usually due to faulty selection or poor technique; it should not take place provided the necessary precautions are taken not to throw the product of too much tissue destruction into the patient's system. In suitable cases, actinotherapy eases cough, increases red cells and hæmoglobin, promotes skin function and muscular tone. "In the initial stages (apical catarrhs, anæmia with phthisical predisposition) it may be designated a specific" (Bach [796]).

Results depend entirely on the organic capacity to react. Advanced toxæmia indicates poor prognosis. Careful selection of cases, cautious dosage, and close observation of results are essential.

Obviously, patients should be removed from adverse home conditions. Rest, good diet, and other therapeutic measures are necessary. Careful records should be kept of temperature, weight, sputum. Fecht, quoted by Heusner (723) and Bach (796), gives procedure for checking progress according to the Arneth blood cell count.

Chapman mentions that among his 100 cases, several who had not responded to artificial pneumothorax or tuberculin treatment were benefited by actinotherapy.

Technique. Alpine Sun Lamp, general body baths, sub-erythema doses, increased gradually. Visible erythema must be avoided. A typical starting dose is 1-2 minutes at 40 inches distance. Repeat every other day, gradually increasing time but keeping to uniform distance (of 40 inches). Special caution (half the normal doses) for blondes.

Increase dosage on normal lines (Tonic Course) for cases of strong constitution, but very gradually for run-down and feverish patients.

Check temperature after each irradiation. Slight rises are unimportant, but stop light baths if it exceeds 99.5° F. If hæmoptysis occurs, intermit light baths and resume when bleeding stops.

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738 Underwood, E. A.—*Brit. Jnl. Tuberculosis*, October, 1932.

Also Nos. 656 664 683 796

Tuberculosis, Renal.

In some cases pain is alleviated and frequency of micturition diminished. Mayer (656) states his opinion that "unilateral renal tuberculosis without marked functional improvement first deserves a fair trial of light therapy." The sequelæ (fistula after nephrectomy, cystitis (q.v.) epididymitis (q.v.) are also indications for actinic irradiation).

Technique. Alpine Sun Lamp, general light baths, Tonic Course, combined with suitable diet.

References:

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Also Nos. 656 791

Tuberculosis, Surgical (Bones and Joints).

(*See also Adenitis, tubercular.*)

"There is no other form of treatment in tuberculosis which can compare with the effect of ultra-violet rays" (793). Customary therapeutic measures, especially rest, diet, fixation if indicated, are important. Prognosis is best in recent, juvenile cases, but age and long standing disease are not contra-indications. Prolonged treatment (three months to two years) is usually necessary.

In all "surgical" forms, hyperæmia greatly assists the erythema therapy. This is dealt with under "Technique" on next page.

Sinuses usually show increased discharge at first, followed after a few weeks by drying up and healing.

If splints are used, it is advantageous to make these with windows so that the skin can be irradiated.

Small bone sequestræ are usually eliminated spontaneously. Operative measures may be called for with large sequestræ, actinotherapy being used to assist subsequent healing. Abscesses, if not spontaneously resorbed, should be aspirated rather than incised.

Technique. Sollux Lamp local, directly on lesion to tolerance (20-30 minutes, 6-4 inches), followed by Alpine Sun Lamp, locally on lesion, 2nd degree erythema, and Alpine Sun Lamp with Sollux Lamp, general body bath, sub to 1st degree erythema dose.

Repeat once to twice weekly, gradually increasing dosage, but keeping below the pigmentation scale so that a systemic reaction is obtained each time. Watch each reaction.

Kromayer Lamp with applicator to any sinus, after flooding with photosensitive dye (see page 48). This special sinus treatment should not be pressed until discharge has spontaneously ceased; otherwise superficial closure may occur.

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751 Weinbren, M.—*Proc. Royal Soc. Med.*, March, 1928.
Also Nos. 656 661 666 668 672 673 682 788 791 793 796 806a 811 824 850

Tuberculosis Verrucosa.

Good results are reported from combination of local and general actinotherapy.

Technique. Kromayer Lamp with blue window, 3rd degree erythema dose (i.e., 5 minutes contact) to any densely infiltrated lesions. Repeat on subsidence.

Alpine Sun Lamp, general tonic irradiation on standard lines (sub to 1st degree erythema). Take usual precautions if associated with pulmonary tuberculosis (q.v.). Also, give 2nd degree erythema to cover entire diseased area.

References:

752 Weinbren, M. & Graham Hodgson, H. K.—*Lancet*, July 24th, 1926.
Also Nos. 690 885 902

Ulcers.

"Whether an ulcer is due primarily to a specific organism or to trauma, secondary infection with pyogenic organisms is always present. This sepsis has to be cleared up before healing takes place. In all ulcers too, the missing epithelial surface must be regenerated. In most chronic ulcers defective circulation and consequent poor nutrition characterize the surrounding tissue. This must be made good" (245).

Local actinotherapy has powerful action in all these respects. The amazing direct bactericidal power of the Kromayer Lamp has almost instantaneous effect. It also acts indirectly by increasing the hæmobactericidal power, stimulating sluggish nutrition, and promoting regeneration of lost epithelium by the tissue cells. The cyanosed appearance frequently associated with varicose ulcer turns, after irradiation, to a much healthier tint.

Technique. Treatment falls into two stages. First, destruction of infection, stimulation of tissue, and restoration of local nutrition. Second, mild stimulation of new granulating tissue in a clean wound until regeneration is complete.

Stage 1 : Clean the ulcer with H_2O_2. Sollux Lamp, with localizer, 15-20 minutes at short distance, followed by Kromayer Lamp at short distance, dosage suited to condition of the lesion. (A moderately septic ulcer may require 20 times ; a very septic ulcer with sloughing edges possibly 100 times the erythema dose).

Repeat 2-3 times at 2-3 day intervals, until a healthy condition is established and new granulations appear.

Stage 2 : Mild irradiation ; e.g., Kromayer Lamp with blue filter (or Alpine Sun Lamp at 40 inches), sub-erythema dose on ulcer surface and surrounding skin. Sollux Lamp with localizer, to produce mild hyperæmia on affected area ; give this before the ultra-violet irradiation, to promote local circulation and assist the actinic reaction.

Repeat at 2-3 day intervals until regeneration is complete. If rate of healing slackens, slight increase of dosage is indicated.

Alpine Sun Lamp, general light baths supplementing the local light treatment are essential in tubercular ulcers. Many experts advise them in all forms of ulcers. Sub to 1st erythema doses are usually indicated ; excessive stimulation must be avoided if there are any signs of thrombo-phletitis.

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763 Weinbren, M.—*Brit. Jnl. Radiology*, October, 1929 (Report on 200 cases, with illustrations). (Extract, *Quartz Lamp*, March, 1930).
764 Macintyre, E. J.—*Brit. Jnl. Actinotherapy*, March, 1931.

Also Nos. 157 245 786 833 848 896 898 904

Urethritis.

The available reports indicate that actinotherapy will find much wider application in urologic treatment when its possibilities have been fully explored. Urethritis from various causes responds well to local irradiation. Dufestel (765) obtained encouraging results in a series of cases of chronic posterior urethritis, ranging from congestive to polypoid œdema, and in anterior urethritis.

Technique. Irradiate the urethra with Kromayer Lamp and urethral applicator inserted full length. The applicator may be lubricated to ease introduction, except at the olive-shaped top. Irradiate for 2 minutes, slowly withdrawing the applicator during this period so as to produce a reaction on the entire membrane affected. Repeat on subsidence, steadily increasing dosage.

References:

765 Dufestel, E. & Lazard, P.—*Journ. d'Urol* (*Paris*), October, 1924. (Abstract, *Quartz Lamp*, May, 1925).

Also No. 883

Urticaria.

Mild applications of actinic rays usually suffice to relieve the intense itching and to clear up the condition.

Technique. Alpine Sun Lamp, general light baths, 1st degree erythema reaction (or 2nd degree locally on affected area, *combined* with 1st degree general exposure). Repeat every second day, six to eight times in all.

References:

766 Mudie, E. C.—*Brit. Med. Jnl.*, March 5th, 1932 (*Quartz Lamp*, S, April, 1932).

Also Nos. 885 896

Vaginitis (*see Gynaecological Conditions*).

Vernal Catarrh (*see Ophthalmology*).

Vincent's Angina.

In treating Vincent's angina, ultra-violet rays have given very good results. Practically all users have reported the use of light highly beneficial in the particular indication.

Technique. No instrumentation or surgery until the acute condition has subsided. If inflamed, then use applicator No. 532, and produce a 2nd degree reaction on the inflamed area. The Kromayer Lamp and applicator may be used about one inch away or a little further, depending upon the area to be irradiated. It is advisable to protect the healthy mucous membrane of the gums with cotton or gauze, so as not to get a reaction on that part.

This should be followed by irradiating the soft tissues of the gums and palate. A 1st degree reaction is advisable to prevent soreness in swallowing.

Rinsing the mouth with a boric acid solution or a 2 per cent. mallophene solution as often as possible is advisable. Caustic medications should not be used.

Only soft food should be eaten.

References:

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Also Nos. 308 310 567 857 858

Vitiligo (*see Leucoderma*).

Whooping Cough (*Pertussis*).

"Improvement in the patient's general condition is usually noticeable from the first exposure to the light, and consists in an obvious brightening and happiness, increase in the amount of sleep obtained, and increase of appetite, and later in tonicity of muscles" (775).

Technique. Alpine Sun Lamp, general body baths (or trunk). 1st degree erythema, repeat daily, increasing as in Tonic Course.

Cases clear up in 10-20 days.

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Also Nos. 263 790 819 853

Wounds.

Actinotherapy is a powerful factor in the healing of wounds. The direct bactericidal action of short-waved rays, combined with the leucotytosis which they produce, quickly overcomes infection, and brings the lesion to a condition where the stimulus of milder irradiation promotes strong, free proliferation of new tissue. Wounds treated in this way heal rapidly with excellent cosmetic results, leaving scars of fine smooth texture, usually level with the skin.

Technique. **Infected wounds.** Cleanse wound with a transparent fluid (e.g., H_2O_2, alcohol or ether ; not iodine). Detach any flaps, etc.

Sollux Lamp. If inflammation is present apply luminous heat rays, using localizer, to produce deep hyperæmia around the lesion (if no inflammation present the luminous heat can be omitted) followed by:—

Kromayer Lamp. At close distance, give 3rd degree erythema dose on surface, to produce increased flow of serum, extrusion of pus, dead tissue, etc. Cover after treatment. For deep punctured wounds, irradiate through applicator, dipping into fluorescent dye as detailed for sinuses (page 48). Repeat this powerful dose only if infection persists after 2-3 days. As soon as the wound is clean and new granulations appear, give mild irradiation (Kromayer Lamp with blue filter, or Alpine Sun Lamp, at 40 inches), 1st degree erythema local doses, daily or every second day.

General light baths, with the Alpine Sun Lamp, on the lines of the Tonic Course, should be given in addition if indicated by the general condition.

Aseptic operation wounds. Mild irradiation as indicated above, i.e., Kromayer Lamp with blue filter, or Alpine Sun Lamp at 40 inches, 1st degree erythema doses daily when dressings are changed.

References:

[776] Bach, H.—Treatment of Wounds with the Artificial Alpine Sun Quartz Lamp (1926, 1/-).
[777] Menard & Saidman.—*C. R. Ac. Sc. Paris*, 1923.
[778] Weinbren, M.—*Brit. Jnl. Actinotherapy*, October, 1926.

Also Nos. 261 894 911 912 913 915 916 918 919

Xanthoma.

Rothman (329) ascertained that the Xanthoma nodules in a diabetic case were repositories of cholesterin, and that actinic irradiation effected their resorption. He suggests that irradiation would be equally effective in other forms; e.g., multiple tuberous Xanthoma.

Technique. Alpine Sun Lamp, general body baths, Sedative Course, continued till nodules disappear.

Reference: 329

X-Ray Dermatoses.

Acute burns. "The treatment of acute X-ray burns is easy and results are secured rapidly. Often the intense pain will ease up after the first treatment and entirely disappear in 5 or 6 days" (786).

Technique. Sollux Lamp on ulcer surface, closest tolerable distance, 30 minutes at least, followed by:—

Kromayer Lamp, massive dose (3-4 times 4th degree) on entire ulcer surface, using applicators to any cavities, followed by:—

Alpine Sun Lamp, 3rd degree erythema on skin surrounding ulcer (but cover the ulcer surface by black silk).

Repeat at intervals of 2-3 days. As new granulations appear, progressively reduce dosage on the ulcer surface so that these are not destroyed, but progressively increase the erythema doses on surrounding skin.

Continue these treatments after the ulcer is apparently healed, adding diathermy to remove deeper fibrosis.

Chronic X-ray burns. Treatment is much more difficult than that of acute burns. Actinotherapy can be usefully used after circulation has been restored and the atrophic skin has regained some degree of reactivity.

Preparatory treatment consists of diathermy and other measures to produce arterial hyperæmia. When the reactions become possible, follow technique outlined above, but keep local exposures down below 4th degree reaction (ascertained from test on the atrophic skin). Add general body baths, on lines of Tonic Course.

Telangiectasis (q.v. for technique). One or two treatments are usually sufficient to obliterate the vessels. Atrophy remains unchanged, the end result being a small whitened scar.

Diagnosis. Erythema due to X-rays can be detected by fluorescence when invisible to the naked eye; affected areas stand out in an intense brown colour against the normal skin. This opens the way to early use of remedial measures.

For details of the fluorescence test, see pages 23 and 142.

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Part III

LIST OF BOOKS AND PAPERS

(supplementing the special lists quoted under conditions)

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Ear, Nose and Throat.

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